United States
Department of
Agriculture

Forest Service

Tongass
National
Forest

R10-MB-349a

January 1998

Control Lake Timber Sales

Supplemental Draft Environmental Impact Statement

Volume I—EIS

Foster Wheeler Environmental Corporation
10900 NE 8th Street
Bellevue, Washington 98004
Contract No. 53-0109-3-00369
Control Lake Environmental Impact Statement

United States Department of Agriculture
Forest Service
Alaska Region
Tongass National Forest
Ketchikan Area
Federal Building
Ketchikan, AK 99901

Reply To: 1950

Date: December 19, 1997

Dear Planning Participant:

Enclosed is the Supplemental Draft Environmental Impact Statement for the Control Lake Project Area.

This Supplemental DEIS was prepared to respond to the following changes: 1) timber volume from Control Lake will no longer go to Ketchikan Pulp Company (KPC) under the Long-Term Timber Sale Contract; 2) the closure of the KPC pulp mill; and 3) the revision and adoption of the new Forest Plan. The document is responsive to the comments we received on the Draft EIS as well.

The Supplemental DEIS is in two volumes and is accompanied with a large scale color map to aid in your review. Color maps at 11"X17" scale for each alternative are included in Volume 1. An 11"X17" scale map that displays the proposed road management strategy is also included in Volume 1.

Alternative 11 in the Supplemental DEIS represents a collaborative effort to identify where best to harvest timber in balance with other uses and resource needs in the Project Area.

Alternative 11 with the following adjustments is my Preferred Alternative.

* Proposed harvest units 597.2-449 and 597.2-450 would be dropped and unit 597.2-414 would be changed to helicopter logging to existing roads. This would strengthen wildlife habitat objectives.

* Clearcutting prescriptions included in proposed harvest units in VCU 597.2 that have helicopter, shovel or running skyline logging systems will be changed to partial cut prescriptions. The purpose of this is to address new TLMP Standards and Guidelines for the marten.

The Thorne Bay Ranger District has been very active in recent weeks working with the public and other interested parties to determine how best to manage the roads on the District. Roads proposed to be open or closed are shown on the Access Plan map in Volume 1 and on the large scale map. Your comments related to specific roads will be most helpful.

You are encouraged to review and comment on the Supplemental DEIS, as well as, the road management strategy. Comments need to be submitted by **March 16, 1998** to:

Forest Supervisor
Tongass National Forest, Ketchikan Area
Attn: CONTROL LAKE SDEIS
Federal Building
Ketchikan, AK 99901

Your input will be used to prepare the Final EIS and Record of Decision. Your interest in the management of the Tongass National Forest is appreciated.

Sincerely,

David Arrasmith for
BRADLEY E. POWELL
Forest Supervisor

enclosure

Supplemental Draft Environmental Impact Statement

Control Lake

United States Department of Agriculture
Forest Service—Alaska Region
Alaska

Lead Agency	U.S.D.A. Forest Service Tongass National Forest Ketchikan Administrative Office
Responsible Official	Forest Supervisor Ketchikan Administrative Area Tongass National Forest Federal Building Ketchikan, Alaska 99901
For Further Information	Dave Arrasmith Planning Staff Officer Ketchikan Administrative Area Tongass National Forest Federal Building Ketchikan, Alaska 99901 (907) 228-6304

Abstract

The Forest Service proposes to implement the Tongass Land Management Plan by harvesting timber in the Control Lake Project Area. Timber volume would be offered to timber companies under the Ketchikan Area Independent Timber Sale Program. The actions analyzed in this EIS are designed to implement direction contained in the Tongass Land Management Plan (TLMP 1997). The Supplemental Draft EIS describes five alternatives which provide different combinations of resource outputs and spatial locations of harvest units. The alternatives are: Alternative 1, No Action, proposes no new harvest from the Project Area at this time; Alternative 10 emphasizes units that can be most readily harvested by small operators and completely avoids harvest in the Honker Divide, Logjam Creek, and Rio Roberts watersheds, and the Western Peninsula; Alternative 11 avoids harvest in the Honker Divide, Upper Logjam Creek, and Rio Roberts watersheds, limits harvest in the Western Peninsula, and allows harvest near the 1997 Forest Plan Revision implementation level in most other zones; and Alternative 12 allows harvest at the full 1997 Forest Plan Revision implementation level in all zones that permit harvest.

This page left intentionally blank

Summary

Introduction

In compliance with the National Environmental Policy Act (NEPA) and other relevant state and Federal laws and regulations, the Forest Service has prepared this Supplemental Draft Environmental Impact Statement (EIS) on the effects of timber harvest in the Control Lake Project Area (Figure 1-1) on Prince of Wales Island, Alaska. This Supplemental Draft EIS is designed to inform the public of the proposed action and its effects, and to solicit public comment for consideration in developing the Final EIS. This Supplemental Draft EIS was prepared to respond to several changed conditions. It also addresses comments received on the Draft EIS.

Changes Between Draft EIS and Supplemental Draft EIS

As indicated above, this Supplemental Draft EIS was prepared to respond to several changed conditions. First, it addresses the fact that timber volume from Control Lake would no longer be provided to Ketchikan Pulp Company (KPC) under the Long-term Timber Sale Contract. Second, it considers the closure of the KPC pulp mill. Finally, it evaluates effects under the existing Forest Plan (TLMP, 1997). Public and agency input and new or revised analyses also produced changes between the Draft EIS and Supplemental Draft EIS as described below.

Public and agency input on the Draft EIS included comments received at the ANILCA Subsistence hearings, EIS open houses, meetings with state and other federal agencies, and written comment letters. Appendix B, which presents the written comments, oral testimony, and Forest Service responses, has been added to the Supplemental EIS. In addition, public input together with the new information identified above led to the deletion of Alternatives 2, 7, 8, and 9 from detailed consideration in the Supplemental Draft EIS. Alternative 10, which was presented in Appendix B of the Draft EIS, has been brought into the main text and two new alternatives were designed. Alternative 11 was designed to be consistent with the 1997 TLMP and responsive to public and agency input regarding wildlife, biodiversity, Honker Divide, the Elevenmile area, subsistence, and other issues. It represents the Preferred Alternative. Alternative 12 was also designed to be consistent with the 1997 TLMP and represents the unit pool under the new Forest Plan. Public comment on the Draft EIS also led to revision and clarification of several analyses.

New analysis was required to incorporate the effects of Alternatives 11 and 12 into Chapters 2 and 4 of the Supplemental Draft EIS. In addition, new analyses were conducted to reflect new land use designations (LUD's), standards and guidelines, and projections made by the new TLMP (1997). New information and public/agency input also led to revision of text and tables in several EIS areas. A summary of the watershed analyses that have been conducted through the Control Lake studies is presented in Appendix E. Unit cards that were substantially revised are presented in Appendix D.

The ROD for the 1997 TLMP identified Control Lake as a Category 3 timber sale project. Projects in Category 3 need to be consistent with all the applicable management direction of the revised plan, except for new standards and guidelines for wildlife, which address landscape connectivity, endemic terrestrial mammals, northern goshawk, and American marten. These new standards and guidelines were implemented in a manner that was least disruptive to the design and implementation of the project. The extent to which these measures were incorporated was determined through review by an interagency implementation team consisting of the National Marine Fisheries Service, Environmental Protection Agency, U.S. Fish and Wildlife Service, and pertinent state agencies.

Proposed Action

The Forest Service proposes to harvest an estimated 94 million board feet (MMBF) of timber, construct or reconstruct an estimated 78 miles of roads, and use existing log transfer facilities (LTF's) at Thorne Bay, Coffman Cove, and other locations to implement the action alternatives. Timber sale offerings from this harvest will be made available to the Independent Timber Sale Program. Based on this environmental study and analysis, the Forest Supervisor will decide on:

- The timber volume to make available from this Project Area;
- The location, design, and schedule of timber harvest, silvicultural, road construction, and reforestation management practices;
- Access management measures (road, trail, and area restrictions and closures); and
- Mitigation measures, Best Management Practices (BMP's), and monitoring measures.

Purpose and Need

The Control Lake Project is proposed at this time to respond to the goals and objectives identified by the Tongass Land and Resource Management Plan (TLMP, 1997) for the Project Area and to move the Project Area towards the desired future conditions described in the TLMP. The Forest Plan identified the following goals and objectives: (1) improve timber growth and productivity on suitable timber lands made available for timber harvest and manage these lands for a long-term sustained yield of timber; (2) contribute to a timber supply from the Tongass that seeks to meet annual and TLMP planning cycle market demand; and (3) provide opportunities for local employment in the wood products industry, which in turn contributes to the local and regional economies of Southeast Alaska (TLMP, pp. 2-3 to 2-4). The Control Lake Project will respond to these goals and objectives, and will also help move the Project Area towards the desired future condition identified by the Plan by managing suitable timber lands for the production of sawtimber and other wood products and allowing a variety of successional stages within the Project Area that provide a range of wildlife habitat conditions (TLMP, pp. 3-127, 3-135 to 3-136, and 3-144).

Public Participation

Public involvement in the Control Lake Project decision-making process began formally on September 27, 1993 with the mailing of the scoping package, which invited comment on the scope of the issues and areas of major concern to be addressed in the environmental analysis. A news release was also issued and newspaper advertisements were also placed about that time containing much of the same information and inviting comments. A Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on October 6, 1993. Public scoping meetings were held in Klawock, Thorne Bay, and Ketchikan. Individual consultations also took place between Control Lake project team members and community representatives, environmental organizations, timber industry representatives, agency representatives, and other interested parties.

The Draft EIS was released in October 1995 and subsistence hearings and public open houses were held in Klawock, Thorne Bay, Coffman Cove, and Ketchikan in December 1995. Many comments were received and reviewed and analyzed; responses are provided in Appendix B of this Supplemental Draft EIS.

A NOI to prepare a Supplemental Draft EIS was published in the Federal Register on August 14, 1997. A news release, announcing the availability of this Supplemental Draft EIS was issued.

Issues

Based on consultation with the public and government agencies, the scoping comments and Draft EIS comments received, the subsistence hearings, and internal scoping, seven issues were identified that were determined to be significant and within the scope of this EIS. These issues have been addressed by alternative development (e.g., a total of 12 different alternatives have been developed and analyzed for the project), with mitigation, or by analyzing the effects in terms of the issues. The seven significant issue areas are: (1) Honker Divide; (2) Recreation and Visual Quality; (3) Subsistence; (4) Wildlife Habitat and Biodiversity; (5) Fish Habitat and Water Quality; (6) Timber; and (7) Karst and Cave Resources.

Alternatives Considered in Detail

Four alternatives are considered in detail in the Supplemental Draft EIS. These include the No Action Alternative (Alternative 1) and three action alternatives (Alternatives 10, 11, and 12). Alternatives 3 and 5 were previously considered, but not analyzed in detail. Alternatives 2, 4, 6, 7, 8, and 9 were previously analyzed in detail and presented in the Draft EIS (including appendices), but are no longer being considered.

Alternative 1

The No Action alternative, Alternative 1, would result in no additional timber harvest or road construction in the Control Lake Project Area. This alternative serves as a baseline, against which the three action alternatives are measured.

Alternative 10

Alternative 10 results in the harvest of 1,281 acres in 38 harvest units producing 38 MMBF of net sawlog and utility volume. To implement this harvest, approximately 30 miles of road would be constructed or reconstructed. This alternative does not schedule harvest in the Honker Divide ("ridge-to-ridge") north of Forest Road 30, in the Upper Logjam Creek area, in Rio Roberts Watershed, or in the Western Peninsula. It attempts to emphasize community-based, value-added products by choosing units that would be more easily harvested by independent and small operators. Units in this alternative minimize road construction, are smaller, and use conventional logging systems. This alternative was independently developed by a group consisting of environmental organization representatives, independent timber contractors, Alaska natives, educators, business owners, and fishermen, most of which are residents of Prince of Wales Island.

Alternative 11

If Alternative 11 is implemented, it would result in the harvest of 3,612 acres in 98 harvest units producing approximately 94 MMBF of new sawlog and utility volume. To implement this harvest, approximately 78 miles of road would be constructed or reconstructed. This alternative was designed to be completely consistent with the 1997 Forest Plan Revision. It avoids harvest within all of the Old-Growth Habitat and Semi-Remote Recreation LUD's including the Honker Divide area, Rio Roberts Watershed, most of the Western Peninsula, and other areas. Alternative 11 reflects collaborative efforts between the Forest Service and other federal and state agencies.

Alternative 12

If Alternative 12 were implemented, it would result in the harvest of 4,452 acres in 123 harvest units producing approximately 113 MMBF of new sawlog and utility volume. To implement this harvest, approximately 98 miles of road would be constructed or reconstructed. This alternative was designed to provide a maximum level of harvest consistent with the 1997 Forest Plan Revision. It avoids harvest within all of the Old-Growth Habitat and Semi-Remote Recreation LUD's including the Honker Divide area, Rio Roberts Watershed, most of the Western Peninsula, and other areas.

Effects of the Alternatives

The effects are summarized, by significant issue, along with the alternative descriptions in Chapter 2. Tables 2-2 and 2-3, located at the end of Chapter 2, provide quantitative summaries of the effects.

Contents

Volume I

Chapter 3 (cont.)

Chapter 4 Environmental Consequences

Chapter 4 (cont.)

Chapter 4 (cont.)

Volume II

Figures

Tables

Tables (cont.)

Chapter 4

Tables (cont.)

Chapter 1

Purpose and Need for Action

Chapter 1

Purpose and Need for Action

Key Terms

Land Use Designation (LUD)—the method of classifying land uses presented in the Forest Plan (Tongass Land Management Plan [TLMP 1997]).

MMBF—million board feet.

Offering—a Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a timber sale.

Old-growth forest—an ecosystem distinguished by old trees and related structural attributes. Old-growth forests encompass the latter stages of stand development. They typically differ from earlier stages of stand development in a variety of characteristics which may include tree size, accumulation of large dead woody material, number of canopy layers and tree species composition, and ecosystem function.

Scoping process—activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate.

Value Comparison Unit (VCU)—areas that generally encompass a drainage basin to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

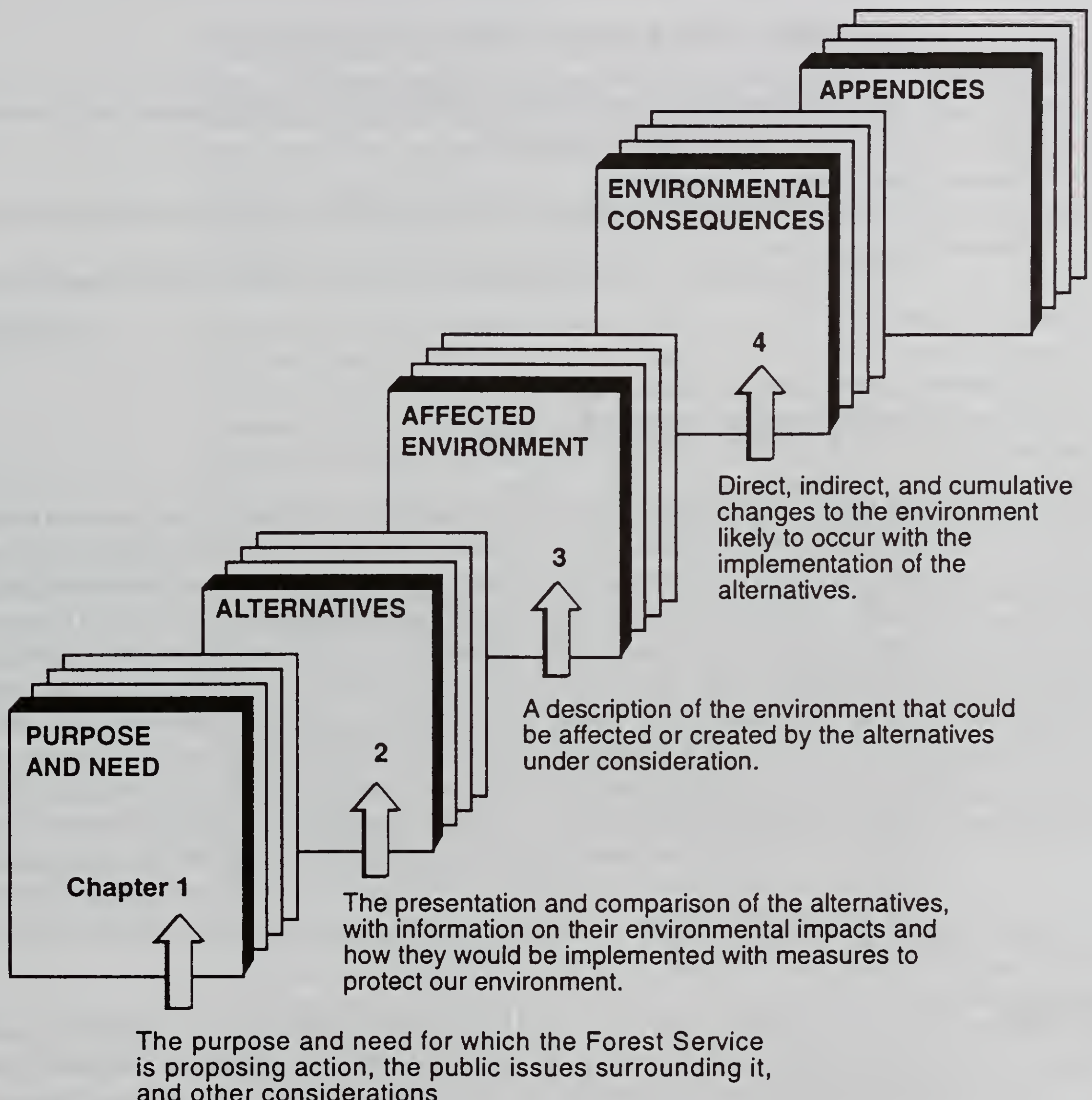
Introduction

In compliance with the National Environmental Policy Act (NEPA) and other relevant state and Federal laws and regulations, the Forest Service has prepared this Supplemental Draft Environmental Impact Statement (EIS) on the effects of timber harvest in the Control Lake Project Area (Figure 1-1) on Prince of Wales Island, Alaska. This Supplemental Draft EIS is designed to inform the public of the proposed action and its effects, and to solicit public comment for consideration in developing the Final EIS. This Supplemental Draft EIS was prepared to respond to several changed conditions. First, it addresses the fact that timber volume from Control Lake would no longer be provided to Ketchikan Pulp Company (KPC) under the Long-term Timber Sale Contract. Second, it considers the closure of the KPC pulp mill. Finally, it evaluates effects under the 1997 Forest Plan Revision. This Supplemental Draft EIS also addresses comments received on the Draft EIS.

The EIS discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from each alternative proposed. It is prepared according to the format (Figure 1-2) established by Council on Environmental Quality (CEQ) regulations implementing NEPA.

Figure 1-1
Project Vicinity Map

Figure 1-2
How this EIS is Organized



Proposed Action

The Forest Service proposes to harvest an estimated 94 million board feet (MMBF) of timber, construct or reconstruct an estimated 78 miles of roads, and use existing log transfer facilities (LTF's) at Thorne Bay, Coffman Cove, and other locations to implement the action alternatives. Timber sale offerings from this harvest will be made available to the Independent Timber Sale Program. Based on this environmental study and analysis, the Forest Supervisor will decide whether and how to make timber available from the Control Lake Project Area to the Independent Timber Sale Program. Forest Supervisor decisions will include:

- The timber volume to make available from this Project Area;
- The location, design, and schedule of timber harvest, silvicultural, road construction, and reforestation management practices;
- Access management measures (road, trail, and area restrictions and closures); and
- Mitigation measures, Best Management Practices (BMP's), and monitoring measures.

Purpose and Need

The Control Lake Project is proposed at this time to respond to the goals and objectives identified by the Tongass Land and Resource Management Plan (TLMP, 1997) for the Project Area and to move the Project Area towards the desired future conditions described in the TLMP. The Forest Plan identified the following goals and objectives: (1) improve timber growth and productivity on suitable timber lands made available for timber harvest and manage these lands for a long-term sustained yield of timber; (2) contribute to a timber supply from the Tongass that seeks to meet annual and TLMP planning cycle market demand; and (3) provide opportunities for local employment in the wood products industry, which in turn contributes to the local and regional economies of Southeast Alaska (TLMP, pp. 2-3 to 2-4). The Control Lake Project will respond to these goals and objectives, and will also help move the Project Area towards the desired future condition identified by the Plan by managing suitable timber lands for the production of sawtimber and other wood products and allowing a variety of successional stages within the Project Area that provide a range of wildlife habitat conditions (TLMP, pp. 3-127, 3-135 to 3-136, and 3-144).

Timber Growth and Productivity

Losses to the timber resource caused by age decay and disease are considerable in old-growth forests, and it is not uncommon for over 30 percent of the timber volume in old-growth stands to be defective and thus unusable for wood products. Tree vigor tends to decrease with maturity, causing an increase in susceptibility to disease and decay fungi. Disease and decay processes are a natural part of forest ecosystems, and play a key role in providing wildlife habitat in old-growth forests. However, the Forest Plan allocated 32 percent of the land within the Control Lake Project Area (non-encumbered lands) to the Timber Production Land Use Designation (LUD). The desired future condition for these lands, as identified by the Forest Plan, states that they are to be managed for the production of sawtimber and other wood products on an even-flow, long-term sustained yield basis (TLMP, p. 3-144). An additional 13 percent of the land within the Control Lake Project Area is allocated to the Scenic Viewshed or Modified Landscape LUD's. The desired future condition for these lands states, in part, that they will produce a yield of timber which contributes to the Forest-wide sustained yield (TLMP, pp. 3-127, 3-136). Harvesting aging stands, including those in declining health, on lands that

allow timber harvest and replacing them with faster growing, healthy stands will reduce the volume loss associated with decay and disease and increase the growth and yield of the managed forest land.

The remaining 55 percent of the Project Area is allocated to non-development LUD's, mostly Old-growth Habitat. The desired condition for Old-growth Habitat lands states that all forested areas in this LUD will have attained old-growth forest characteristics, providing a diversity of old-growth habitat types and associated species and subspecies and ecological processes. Timber volume from this LUD (such as salvage) does not contribute to the Forest-wide allowable sale quantity.

Currently western hemlock makes up about 80 percent of the old-growth forests in the Project Area. Western hemlock is susceptible to dwarf mistletoe, a disease that does not infect Alaska cedar or western red cedar and rarely infects Sitka spruce. Western hemlock also appears to have more insect enemies than Sitka spruce. In addition, western hemlock has the lowest economic value of the four species. Harvesting existing stands dominated by the western hemlock will encourage the growth of the Sitka spruce and the cedars, creating a more diverse species mix and minimizing losses due to insects and diseases that are species-specific.

Market Demand

Section 101 of the Tongass Timber Reform Act (TTRA) directs the Forest Service to "seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest; and (2) meets the market demand from such forest for each planning cycle," to the extent consistent with the multiple use and sustained yield of all renewable forest resources (among other limitations). Market demand for Tongass timber is derived from factors including Southeast Alaska's timber industry mill capacity; local, national, and international timber markets; and projected local, national, and worldwide timber supplies.

The Alaska Region uses the projections of the Pacific Northwest Research (PNW) Station to help determine demand for Tongass timber. The latest PNW Station market demand estimates for Tongass timber through the year 2010 are based on three projections, or scenarios, of demand (low, medium, and high). In the low demand scenario, high stumpage, harvest, and manufacturing costs limit Alaska's share of markets. Under the high demand scenario, increased harvest and manufacturing efficiency, with resulting lower costs, make Alaskan mills more competitive. Projected annual sawlog demand for the next decade is 113 million board feet (MMBF) for the low scenario, 133 MMBF for the medium, and 156 MMBF for the high scenario (Brooks and Haynes, 1997).

The intent of the Forest Service is to provide the opportunity for the timber industry as a whole to acquire a supply of purchased but unharvested timber equal to about three years of timber consumption, considering the average rate of harvest for the past few years and any indicators of change in that rate from planning cycle projections or other sources. This supply is a means of providing for stability in relation to fluctuating market demand. It is estimated that a 3-year supply of timber, based on medium demand projections, is 399 MMBF.

As of June 30, 1997, there is 504 MMBF of unharvested timber volume under contract to the timber industry (Automated timber Sales Accounting System Report 900, June 30, 1997). Of this volume, however, 300 MMBF is allocated to KPC under the terms of the long-term contract settlement agreement, with 204 MMBF under independent industry contract. Thus, in order to meet the intent of having a 3-year supply, approximately 195 MMBF of timber needs to be cleared through the NEPA process and offered to the industry. To meet this objective, approximately 195 MMBF of timber needs to be cleared through the NEPA process and offered to the industry. It takes approximately 3 years for timber to be cleared trough the NEPA process. At this time, there is approximately 624 MMBF proposed under other ongoing NEPA analyses on the Tongass for the 1998 to 2002 period. Any timber volume from the Control Lake Project Area will contribute towards the three-year supply objective.

Timber volume from the Control Lake Project Area will be provided as a component of the ten-year schedule identified by the Forest Plan, which attempts to provide timber to industry in an even flow over the planning cycle. The Forest Plan states that the Ketchikan Area is expected to contribute 121 MMBF (average annual sell) per year for the next ten years (TLMP, Appendix L-8). This schedule is based, in part, on the Tongass FORPLAN model which is a linear programming software program used to analyze planning decisions regarding land use patterns, capital investment, and timber harvest scheduling. Appendix A of this Supplemental Draft EIS provides the rationale for why the Control Lake Project Area was selected for analysis at this time. In summary, Appendix A states that the Timber Sale(s) Project Area was selected at this time because:

- The TLMP allocated over 32 percent of the area as a Timber Production Land Use Designation (LUD), with sufficient timber volume available to help meet market demand;

- Timber management activities will contribute to meeting the goals, objectives, and desired condition for this LUD;

- Most of the other Timber Production LUD's on the Forest have or are planning to have timber management activities scheduled in them;

- Timber harvest infrastructure (roads, log transfer site, rock quarries) are in place or in need of maintenance to reduce potential resource damage;

- To provide local employment opportunities in the wood products industry, consistent with providing for the multiple use and sustained yield of all renewable forest resources.

The Control Lake Project is a component of the Ketchikan Area's timber management plan to contribute towards the volume identified by the Forest Plan sale schedule and will help meet TTRA and the Forest Plan's goals and objectives. At this time, the Ketchikan Area has approximately 160 MMBF in additional volume undergoing NEPA analysis which could also contribute towards the sale schedule volume.

Local Employment Opportunities

Timber is one of several valuable resources on the Tongass and many people depend on it for their livelihood. Timber from the Tongass is harvested for sawn wood products such as lumber and cants and wood chip exports, and is the basis for a major industry in Southeast Alaska that provided about 1,749 direct jobs in Fiscal Year 1996 (Alaska Department of Labor, May 1997). The Tongass timber program is part of a long-term cooperative effort among the Federal government, the State of Alaska, and local governments to provide greater economic diversity and stability in Southeast Alaska and more year-round employment. The Control Lake Project will contribute towards this effort, providing the opportunity for approximately 8.24 jobs and $350,000 in associated income per MMBF harvested (Forest Service IMPLAN model - base year 1992). Thus, the Proposed Action for the Control Lake Project Area would provide the opportunity for approximately 775 jobs and $32.9 million in associated income.

Project Area

The 201,371-acre Control Lake Project Area is located on Prince of Wales Island, approximately 50 air miles west of Ketchikan, Alaska (Figure 1-1). Craig and Klawock sit to the south of the Project Area and Thorne Bay to the east. The Project Area contains the Rio Roberts Research Natural Area, designated to allow natural processes to evolve without measurable human influence for research and development purposes. The Thorne River and

Hatchery Creek combine to form a free-flowing river corridor along the eastern edge of the Project Area. This corridor is referred to in this EIS as the Honker Divide, extending for about 42 miles from Barnes Lake to the Thorne River estuary. The corridor offers nationally recognized recreation opportunities including canoeing, fishing, wildlife viewing, and hunting. The river system was recommended in the Record of Decision (ROD) for the new Forest Plan (1997) for addition to the National Wild and Scenic Rivers System as a combination Scenic/ Recreational River.

The Decision-Making Process

National forest planning takes place at several levels. The decision making begins with long-range planning at the national level, continuing down through the regional and forest levels to the project level. The Control Lake Project is part of this hierarchical planning process. This Supplemental Draft EIS is a project-level analysis; its scope is confined to issues within the Control Lake Project Area. It does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels.

Relationship to Forest Plan

The National Forest Management Act of 1976 (NFMA) directs each National Forest to prepare an overall plan of activities. The Forest Plan provides land and resource management direction for the forest. It establishes LUD's to guide management of the land for certain uses. The LUD's describe the activities that may be authorized within Value Comparison Units (VCU's). VCU's generally subdivide the LUD's into logical analysis units.

The Forest Plan also guides all natural resource management activities by establishing forest-wide standards and guidelines. These standards and guidelines apply to all or most areas of the Forest and are used in conjunction with the management prescriptions for each LUD.

For the Tongass National Forest, the Forest Plan is the 1997 TLMP. The Control Lake EIS tiers to the TLMP EIS (TLMP 1997) and the Alaska Regional Guide EIS (1983). In some instances, it incorporates documented analysis from TLMP or the various TLMP Drafts by reference (40 Code of Federal Regulations [CFR] 1502.21) rather than repeating it in this EIS.

Land Use Designations

The 1997 TLMP designates areas appropriate for various activities through the use of 19 LUD's. These LUD's include management objectives and specific standards and guidelines designed to ensure attainment of those objectives. Standards and guidelines take precedence over annual targets or projected outputs; no project will be funded for which the standards and guidelines cannot be implemented. The TLMP LUD's in the Project Area are described below. Figure 1-3 shows the VCU's and 1997 TLMP LUD's.

- **Timber Production -** These lands are managed for the production of saw timber and other wood products on an even-flow, long-term sustained yield basis. An extensive road system will be developed for accessing the timber and for recreation uses, hunting, fishing, and other public and administrative uses. Management activities will usually dominate most seen areas. A variety of wildlife habitats, predominantly in the early and middle successional stages, are present. They comprise 32 percent of the non-encumbered National Forest System lands in the Project Area.

- **Modified Landscape -** This LUD provides for a variety of uses. Timber harvest and roads are allowed and the yield contributes to the Forest-wide sustained yield. Management activities are subordinate to the characteristic landscape as seen in the foreground from popular travel routes and use areas. In the middle to background distance, management activities may dominate the characteristic landscape. A variety of successional stages

provide a range of wildlife habitat conditions. The Modified Landscape LUD occupies 9 percent of the Project Area.

- **Scenic Viewshed -** In areas managed under the Scenic Viewshed LUD, forest visitors and others using identified popular travel routes and use areas will view a natural-appearing landscape. Management activities in the foreground will not be evident to the casual visitor. Activities in the middleground and background will be subordinate to the characteristic landscape. Timber yields will contribute to the Forest-wide sustained yield. A variety of successional stages providing wildlife habitat occur, although late-successional stages predominate. The Scenic Viewshed LUD comprises 4 percent of the Project Area.

- **Semi-remote Recreation -** Areas in the Semi-remote Recreation LUD are characterized by generally unmodified natural environments. Ecological processes and natural conditions are only minimally affected by past or current human uses or activities. Timber harvest and road construction are generally not permitted. This LUD occupies 13 percent of the Project Area.

- **Old-growth Habitat -** In lands within this LUD, old-growth forests are to be maintained and early seral conifer stands are to be managed to achieve old-growth forest characteristics. The objective is to achieve a diversity of old-growth habitat types and associated species and subspecies and ecological processes. Timber harvest is not permitted except to achieve the LUD objective and roads and other facilities are to be avoided. These lands occupy 34 percent of the Project Area.

- **Scenic River -** The Scenic River LUD is used to maintain, enhance, and protect the free-flowing character and outstandingly remarkable values of river segments designated as Scenic Rivers and included in the National Wild and Scenic Rivers System. Ecological processes and changes may be somewhat affected by human uses. Recreation users are to have the opportunity for experiences ranging from Primitive to Roaded Natural in a natural-appearing setting. A yield of timber may be produced that contributes to the Forest-wide sustained yield, but resource activities within the river corridor are not to be visually evident to the casual observer. This LUD comprises 7 percent of the Project Area.

- **Recreational River -** The Recreational River LUD is used to maintain, enhance, and protect the essentially free-flowing character and outstandingly remarkable values of river segments designated as Recreational Rivers and included in the National Wild and Scenic Rivers System. Ecological processes and changes may be affected by human uses. Recreation users are to have the opportunity for a variety and range of experiences in a modified but pleasing setting. A yield of timber may be produced that contributes to the Forest-wide sustained yield. Resource activities and developments may be present within the river corridor and may dominate some areas. Less than 1 percent of the Project Area is occupied by this LUD.

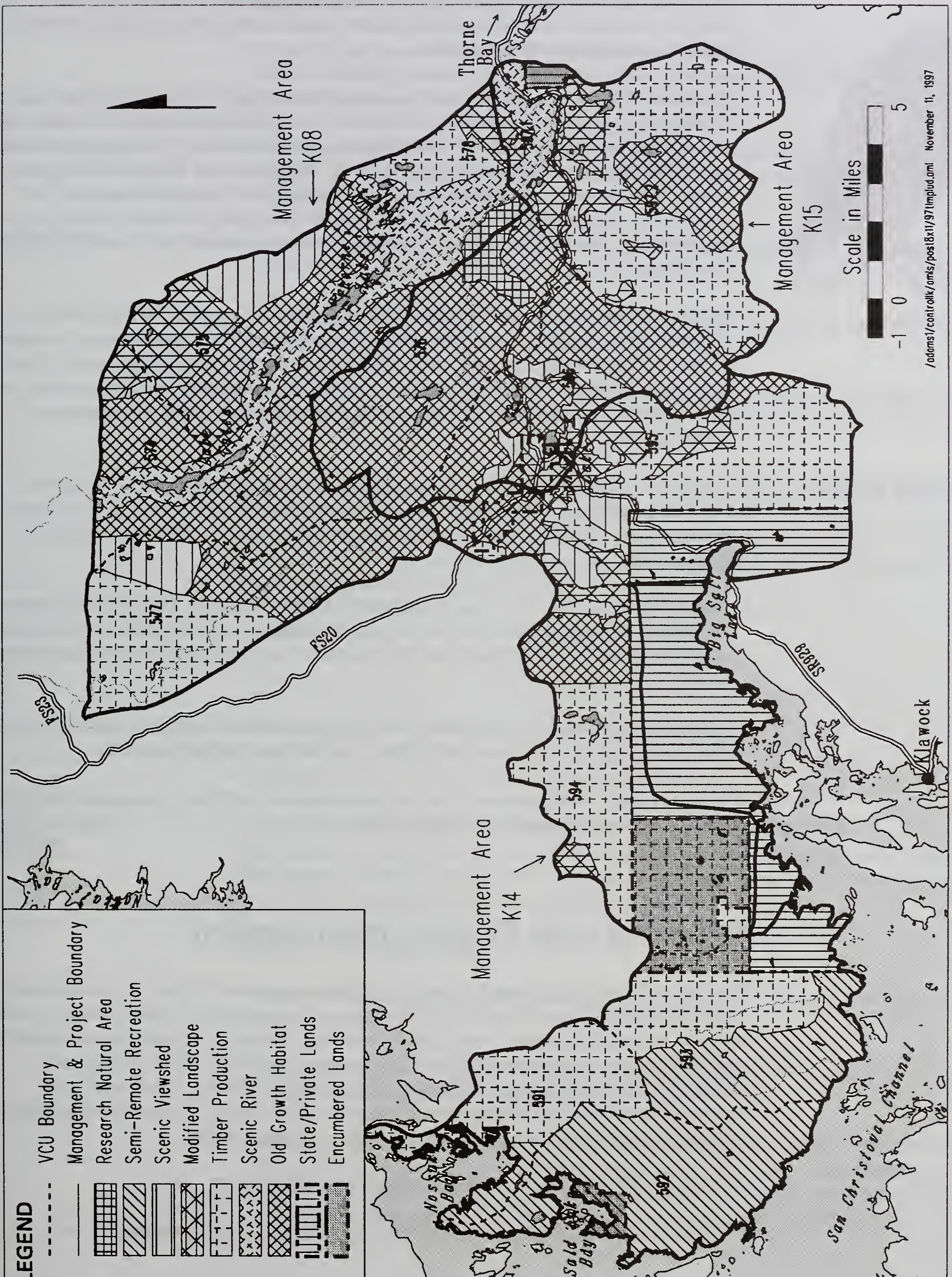
- **Research Natural Area -** This LUD is used to preserve areas of ecological importance in their natural condition for the purposes of research, monitoring, education, and/or to maintain natural diversity. They are characterized by essentially unmodified environments in which natural ecological processes prevail. This LUD represents 1 percent of the Project Area.

Forest-wide Standards and Guidelines

The following forest-wide standards and guidelines apply to areas within the LUD's. They often represent additional restrictions and are used in conjunction with the management prescriptions for each LUD.

- **Beach and Estuary Fringe -** The beach and estuary fringe is an area approximately 1,000 feet slope distance inland from the mean high tide around all marine coastline. Programmed

Figure 1-3
VCU's and 1997 TLMP Revision LUD's



timber harvest is not allowed and roads are to be located outside of beach and estuary fringes whenever possible. The fringes are to be managed to maintain their ecological integrity to provide sustained natural habitat conditions and requirements for wildlife, fish, recreation, heritage, scenery, and other resources.

- **Riparian -** The riparian standards and guidelines are designed to maintain riparian areas in mostly natural conditions for fish, other aquatic life, old-growth and riparian-associated plant and wildlife species, and water-related recreation, and to provide for ecosystem processes, including important aquatic and land interactions. To achieve this, Riparian Management Areas (RMA's), which are areas of special concern to fish, other aquatic resources, and wildlife, are delineated as identified in the stream process group direction found on pages 4-56 through 4-73 in the Forest Plan. Timber harvest is not scheduled in Riparian Management Areas.

- **Karst and Cave Resources -** The karst and cave resource standards and guidelines are designed to maintain the natural karst processes and the productivity of the karst landscape while providing for other land uses and to protect and maintain significant caves and cave resources. Potential karst areas have been analyzed and categorized into low, medium, and high vulnerability categories. High vulnerability areas are not suitable for programmed timber harvest.

Other Land Status

In addition to national forest lands that are managed according to the above LUD's, some national forest lands are encumbered because they have been selected by the State or Native corporations. Non-federal lands also occur within the project area. These other lands are described below.

- **Encumbered Lands -** This is not a designated LUD in the TLMP. However, for purposes of this EIS, it designates areas within the Project Area that have been selected but not yet conveyed to the State or to Native corporations and are not considered in the action alternatives.

- **Alaska State Lands -** These are lands belonging to the State of Alaska. In the Project Area, State-owned parcels occur near Thorne Bay, Control Lake, and Salt Lake Bay.

- **Private Lands -** A large parcel of private land occurs in the Project Area around the Big Salt Lake. This parcel is owned by Sealaska Corporation.

Scoping and Public Involvement

The Control Lake Project Team followed the NEPA process (40 CFR 1501.7) to determine the scope of the issues to be addressed by the environmental analysis and to identify major concerns related to the proposed action. Scoping and public involvement are ongoing processes used to invite public participation and collect initial comments. The Project Team sought public comment through several means, including those summarized below. The Control Lake Scoping Report (Enserch Environmental Corporation, 1994) and the Project Planning Record contain a full description of scoping and public involvement activities.

- Scoping package mailed to Project mailing list on September 27, 1993.

- Notice of Intent to prepare an EIS published in Federal Register on October 6, 1993.

- Newspaper advertisements announcing scoping process placed in the *Ketchikan Daily News* and the *Island News* on October 4, 1993.

- News release issued on September 28, 1993 announcing scoping process. Scoping meetings held in Klawock (October 18, 1993), Thorne Bay (October 19, 1993), and Ketchikan (October 20, 1993).

- Individual consultations held from June 1993 through October 1994 with community representatives, environmental organizations, timber industry representatives, agency representatives, and other interested parties.

Draft EIS

- News release announcing the release of the Draft EIS sent to all media outlets on the Ketchikan Area Public Affairs Office mailing list.

- Newspaper advertisements announcing the schedule and locations of the subsistence hearings placed in the *Ketchikan Daily News* and the *Island News.*

- Draft EIS released in October 1995. Release of the Draft EIS triggered a minimum 45-day public comment period; however, comments were received and considered well into early 1996.

Subsistence hearings on the Draft EIS were held in the communities listed below. Open houses were held in conjunction with the subsistence hearings to describe the analysis process and answer public questions on the Draft EIS. Public comment on the Draft EIS was accepted at that time. Dates, times, and locations were included in the cover letter accompanying the Draft EIS and were publicized in the local media.

- Ketchikan — December 4, 1995
- Klawock — December 5, 1995
- Thorne Bay — December 6, 1995
- Coffman Cove — December 7, 1995

Supplemental Draft EIS

Analysis and Incorporation of Public Comments on the Draft EIS

Public comments and subsistence comments were reviewed, analyzed, and incorporated into the Supplemental Draft EIS. Written comments, hearing testimony, and Forest Service responses are included in Appendix B of the Supplemental Draft EIS.

Issuance of Supplemental Draft EIS

- Notice of intent to prepare a Supplemental Draft EIS published in Federal Register on August 14, 1997.

- News release announcing the release of the Supplemental Draft EIS sent to all media outlets on the Ketchikan Area Public Affairs Office mailing list.

- Release of the Supplemental Draft EIS triggers a minimum 45-day public comment period. The period for public comment on this Supplemental Draft EIS and the deadline for receipt of written comments are noted in the cover letter accompanying this document and will be publicized in the local media. Written comments on the EIS can be mailed to:

Forest Supervisor
ATTN: Control Lake EIS
Tongass National Forest
Federal Building
Ketchikan, AK 99901

Final EIS

Analysis and Incorporation of Public Comments on the Supplemental Draft EIS

Public comments on the Supplemental Draft EIS will be analyzed and incorporated into the Final EIS.

Issuance of Final EIS

A Final EIS is projected to be released in 1998 along with a ROD summarizing the alternatives considered and will state which one is to be implemented. The ROD will also summarize measures to mitigate adverse environmental impacts and applicable project monitoring.

Issues

Based on the consultation conducted with members of the public and government agencies, the scoping comments and Draft EIS comments received on the Control Lake Project, and the internal scoping process, seven issues were identified that were determined to be significant and within the scope of this EIS. These seven issue areas, Issues 1 through 7 below, represent concerns raised by the public, agencies, Native Alaskan tribal governments, or the Forest Service. They were addressed through alternative development, and the environmental consequences of the alternatives have been analyzed in terms of these issues. At the end of this section, issues considered but eliminated from detailed study, because their resolution falls outside the scope of the Control Lake Project, are presented.

Significant Issues

Issue 1: Honker Divide

A key public concern is the use of the Honker Divide area, a nationally recognized recreation corridor. Some respondents advocate protecting the area from timber harvest and road construction. Definitions of the Honker Divide area vary, but some respondents advocate a protected area that contains the lands from ridge top to ridge top, including the Control Creek basin. Some, however, desire additional roaded access points to the lake and river system which they say would increase recreational opportunities. Several commenters cited the high value of the Honker Divide wildlife habitat and referred to the Viable Population (VPOP) Committee recommendations and the protection of the large old-growth block in the Honker Divide area as ways to maintain a functioning old-growth ecosystem on Prince of Wales Island. Others cite Honker Divide as particularly important for fish habitat.

Issue 2: Recreation and Visual Quality

In addition to the interest in the Honker Divide from a recreational standpoint, commenters expressed concern with the recreation impact of the loss of roadless areas on Prince of Wales Island. Some advocated maintaining the visual quality of the 30 Road Corridor and Cutthroat Lakes Area. This heavily used travel route (to Thorne Bay) includes the Eagles Nest Campground and Control Lake. It remains in a relatively natural state, and was designated for visual management as a Priority Travel Route. Suggestions include using selective harvest along this very heavily traveled road to maintain the visual quality of the corridor. Some of the most popular fishing holes occur in this area (e.g., between the 30 Road and the Thorne River). The trail to the lower Rio Roberts Creek fish pass is heavily used, and some noted that harvesting the area adjacent to the trail would affect the aesthetics of fish viewing.

Issue 3: Subsistence
This issue centers around the potential effects, including the cumulative effects, of timber harvest and road construction on the abundance and distribution of subsistence resources, and the opportunities for harvest of these resources. Commenters noted that roads reduce subsistence opportunities; they also make it easier for wolves to cover territory faster, increasing their successful predation of deer. Some commenters, however, want roads left open after logging is completed for ease of access and to facilitate deer harvest. Some expressed concern specifically with the effects of timber harvest in the Western Peninsula because of the high subsistence use there by the residents of Klawock and Craig. Concern ranges from diminished subsistence resources to increased competition for subsistence resources due to the presence of logging roads. This area has unique cultural significance for Alaska Natives, especially from Klawock. Adjacent bays also provide valuable protected anchorages for local boats. Other aspects of subsistence concern include competition from nonrural resource users and access to the resources, as well as changes in the character of the experience of the activity as a focus of cultural identity.

Issue 4: Wildlife Habitat and Biodiversity
The Project Area provides important wildlife habitat, and the wildlife supported are valuable for subsistence, recreational, aesthetic, economic, and ecological purposes. Of primary concern are the effects of timber harvest and associated road construction on species dependent on old-growth forest habitat. Also of concern are the effects of timber harvest operations, due to the fragmentation of existing large blocks of old-growth habitat and the potential decline in biological diversity. This issue relates to a number of different conservation strategies including those involving old-growth reserves. This issue also includes the long-term disposition of previously mapped old-growth areas (or other areas as old-growth retention) in the Project Area. The Rio Roberts Watershed is part of this concern since it serves as a corridor connecting the large unharvested block of old growth in Honker Divide with the Karta Wilderness.

Issue 5: Fish Habitat and Water Quality
This issue addresses public concern for maintaining water quality in streams and nearshore marine waters that provide habitat for anadromous, resident, and marine fish. Streams and streamside habitat throughout the Project Area provide important shelter, food, spawning, and rearing areas for anadromous and resident fish. Crab, shrimp, clams, mussels, and various marine fish are found in the estuaries and marine waters associated with the Project Area. Anadromous and resident fish are important to sport, commercial, and subsistence users throughout Southeast Alaska. Some expressed concern about harvest on steep, unstable slopes and about additional harvest and road-building in the Rio Beaver Watershed. Others objected to timber harvest in the Rio Roberts Watershed, which provides a good control for fish and water quality studies. The lower part of this watershed area (not including the fish pass and trail used in ongoing smolt studies) is proposed as a Research Natural Area (RNA).

Issue 6: Timber
This issue encompasses public concern with the amount of timber available and proposed for harvest. Specific issues include maintaining a timely and sufficient timber supply to the timber industry, whether timber harvest should be continued, how to balance timber production with other Forest uses, and how to apportion the harvest. It includes the issue of how the Project Area contributes to the long-term timber supply and whether too much timber is being harvested at this time on Prince of Wales Island. This issue also relates to maintaining the economic viability of future entries in the Project Area; but it also relates to the concern for developing alternatives that can avoid below-cost sales. It also includes the question of whether there should be timber harvest in the Honker Divide; some say no because of its recreational value, others say yes because of the economic benefits that logging the area would have for the region.

Some argue that the harvest units in the Western Peninsula, specifically, are not economic. This issue includes the question of how much helicopter logging should be used because of the expense of such logging. Public concern also includes the fact that the Project Area historically has been designated for the independent sales program because it is outside the KPC primary sale area. Finally, several commenters said that the purpose and need for the project should not be tied to a specific volume; 187 MMBF may be too high for this area.

Issue 7: Karst and Cave Resources

Concern with this issue centers on how cave and karst resources in the Project Area will be managed. Although cave systems and karst occur in the Control Lake Project Area, they are less extensive than on other areas of northern Prince of Wales Island. Recent studies reveal that extensive cave systems and other karst features throughout Prince of Wales Island represent a complex ecosystem involving hydrology, fisheries production, high wildlife value, and high timber productivity. Caves also have a higher probability of cultural resources. Significant cave systems require protection under the Cave Resource Protection Act of 1988. Areas underlain by karst, because of their high timber productivity, have been heavily affected by timber harvest over the past 30 years. Concern with the cumulative impacts of this and future timber harvest is growing.

Issues Outside the Scope of this EIS

The following items raised in scoping letters fall outside the scope of this project-specific EIS:

- Consider Honker Divide for "wild" status under the Wild and Scenic Rivers Act. This is a Forest planning issue. Wild and Scenic River eligibility and suitability analyses and recommendations for designations were dealt with during the Forest planning process.

- Below-cost timber sales should end. This is a national issue and not within the scope of an individual project.

LEGISLATION AND EXECUTIVE ORDERS RELATED TO THIS EIS

Below is a brief list of laws and Executive Orders pertaining to timber harvest and the preparation of EISs on Federal lands. Some of these laws are specific to Alaska, while others pertain to all Federal lands.

- Alaska National Interest Lands Conservation Act (ANILCA) of 1980
- Alaska Forest Resources and Practices Act of 1979 (as amended in 1991)
- Alaska Native Claims Settlement Act (ANCSA) of 1971
- American Indian Religious Freedom Act of 1978
- Archaeological Resources Protection Act of 1979
- Archaeological Resources Protection Act of 1980
- Cave Resource Protection Act (1988)
- Clean Air Act of 1970 (as amended)
- Clean Water Act of 1977 (as amended)
- Coastal Zone Management Act (CZMA) of 1976
- Endangered Species Act of 1973

- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974
- Marine Mammal Protection Act of 1972
- Multiple Use Sustained Yield Act of 1960
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- National Historic Preservation Act of 1966
- Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601)
- Tongass Timber Reform Act (TTRA) of 1990
- Wild and Scenic Rivers Act of 1968, amended 1986
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 11593 (cultural)
- Executive Order 12898 (environmental justice)
- Executive Order 12962 (recreational fishing)

Several other laws and planning documents deserve particular note because of their direct influence on the timber sale program:

- **TTRA**—the Tongass Timber Reform Act was signed into law by President Bush on November 28, 1990. This TTRA made certain unilateral changes in the KPC Long-term Contract to make it more consistent with independent National Forest timber sales programs, required the Tongass National Forest to seek to meet the market demand for timber, and required minimum stream buffers for fish protection.

- **ANCSA**—the Alaska Native Claims Settlement Act, Public Law 92-203, 85 Stat. 688 (as amended), was enacted in 1971 to provide for the settlement of certain land claims of Alaska Natives. ANCSA has been the basis for conveying selected lands under administrative jurisdiction of the Tongass National Forest to Native corporations.

- **ANILCA**—ANILCA, signed into law on December 2, 1980 (Public Law 96-487), established several areas to be preserved for the benefit, use, education, and inspiration of present and future generations. Title VIII of the Act addresses the use of public lands for subsistence—the customary and traditional uses by rural Alaska residents of wild, renewable resources.

- **CZMA**—the Coastal Zone Management Act of 1976 also pertains to the preparation of EISs. While Federal lands are excluded from the coastal zone as prescribed in the Act, the Act does require that when Federal agencies conduct activities that directly affect the coastal zone, those activities must be consistent to the maximum extent practicable with the approved State coastal management program. The Alaska coastal management program is contained in the Alaska Coastal Management Plan.

- **Prince of Wales Area Plan**—the Prince of Wales Area Plan proposes guidelines for how State-owned lands should be managed within the Prince of Wales planning area (ADNR, 1988).

FEDERAL AND STATE PERMITS AND LICENSES

To proceed with the timber harvest as addressed in this Supplemental Draft EIS, various permits must be obtained from other government agencies. The agencies and their responsibilities are listed below.

- U.S. Army Corps of Engineers

  Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act).

  Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

- U.S. Environmental Protection Agency

  Storm water discharge permit.

  National Pollutant Discharge Elimination System review (Section 402 of the Clean Water Act).

- State of Alaska, Department of Natural Resources

  Authorization for occupancy and use of tidelands and submerged lands.

- State of Alaska, Department of Environmental Conservation

  Certification of compliance with Alaska Water Quality Standards (Section 401 Certification).

  Solid Waste Disposal Permit (Section 402 of the Clean Water Act).

- U.S. Coast Guard

  Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed within the tidal influence zone.

AVAILABILITY OF PROJECT FILES

The Planning Record is a comprehensive project file documenting the process of developing this Supplemental Draft EIS. A library of important supporting documents and maps from the Planning Record, as well as a copy of the Planning Record index, will be maintained in the Forest Supervisor's office in Ketchikan, Alaska. The complete Planning Record is in the Bellevue, Washington office of the contractor (Foster Wheeler Environmental Corporation) that conducted the environmental analysis in consultation with the Forest Service. Many items can be found at both Foster Wheeler Environmental Corporation and the Forest Supervisor's office. The reader also may want to refer to the 1997 TLMP Revision, the Tongass Timber Reform Act, the Resource Planning Act, the Alaska Regional Guide and its Final EIS, ANILCA, or ANCSA. These are available at public libraries around the region as well as all Forest Service offices.

Chapter 2

Alternatives

Chapter 2

Alternatives

Key Terms

BMP's— Best Management Practices - practices used for the protection of water quality.

Desired future condition— a concise statement that describes a desired condition to be achieved sometime in the future. The 1997 TLMP Revision describes a desired future condition for each LUD. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed.

Implementation monitoring— collecting information to evaluate whether mitigation measures were carried out in the manner called for.

Late-successional— referring to an older forest (about 100 to 200 years old) just prior to becoming old growth.

Mid-market— an economic estimate of timber value at a point in time when half of the timber was harvested at a higher value and half was harvested at a lower value.

Mitigation— measures designed to counteract or lessen environmental impacts.

MMBF— a million board feet. A board foot is that volume of wood equivalent to a board 12 inches by 12 inches by 1 inch in size.

Partial cut— harvest of timber using silvicultural prescription other than clearcut; examples include shelterwood, seed tree, and group selection.

Subsistence— the customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption.

Introduction

This chapter describes and compares the alternatives considered by the Forest Service for the Control Lake Project. The first section describes the process followed to formulate the alternatives. The next section addresses how ecosystem management is being implemented on this project. This section is followed by descriptions of the alternatives considered but eliminated from detailed study, and the alternatives considered in detail. A comparison of the alternatives, including how each alternative addresses the significant issues, follows these sections. The last two sections describe site-specific mitigation measures and the monitoring proposed for the project.

Changes between Draft EIS and Supplemental Draft EIS

This Supplemental Draft EIS was prepared to respond to several changed conditions. First, it addresses the fact that timber volume from Control Lake would no longer be provided to KPC under the Long-term Timber Sale Contract. Second, it considers the closure of the KPC pulp mill. Finally, it evaluates effects under the existing Forest Plan (TLMP, 1997). Other new information, public and agency input, and revised analyses also produced changes between the Draft EIS and Supplemental Draft EIS as described below.

New Information

A variety of new information was incorporated into the Supplemental Draft EIS. The major items are identified as follows:

- Modified Long-term KPC Contract (Control Lake is not to provide contract volume)
- Closure of KPC pulp mill at Ward Cove near Ketchikan
- 1997 TLMP and supporting documents
- Revised Appendix A (Reasons for Scheduling the Environmental Analysis of the Control Lake Project Area)
- Updated timber supply information

Public/Agency Input

Public and agency input on the Draft EIS included comments received at the ANILCA Subsistence hearings, EIS open houses, meetings with state and other federal agencies, and written comment letters. Appendix B, which presents the written comments, oral testimony, and Forest Service responses, has been added to the Supplemental EIS. Specific concerns regarding wildlife, biodiversity, Honker Divide, the Elevenmile area, subsistence, and other issues led to the development of a new alternative, Alternative 11, and its incorporation into the Supplemental Draft EIS.

In addition, public input together with the new information identified above led to the deletion of Alternatives 2, 7, 8, and 9 from detailed consideration in the Supplemental Draft EIS. Alternative 10, which was presented in Appendix B of the Draft EIS, has been brought into the main text and two new alternatives were designed. Alternative 11 was designed to be consistent with the 1997 TLMP and responsive to public input. It represents the Preferred Alternative. Alternative 12 was also designed to be consistent with the 1997 TLMP and represents the unit pool under the new Forest Plan. Public comment on the Draft EIS also led to revision and clarification of several analyses.

Revised Analysis

New analysis was required to incorporate the effects of Alternatives 11 and 12 into Chapters 2 and 4 of the Supplemental Draft EIS. In addition, new analyses were conducted to reflect new Land Use Designations (LUD's), standards and Guidelines, and projections made by the new TLMP (1997). New information and public/agency input also led to revision of text and tables in several EIS areas. A summary of the watershed analyses that have been conducted during the Control Lake studies is presented in Appendix E. Unit cards that were substantially revised are presented in Appendix D.

TLMP (1997) Transition

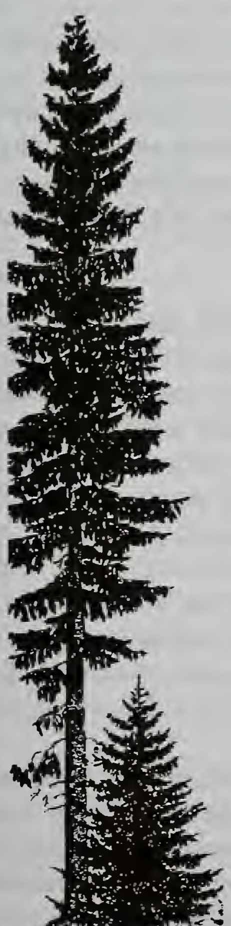
The ROD for the 1997 TLMP identified Control Lake as a Category 3 timber sale project. Projects in Category 3 need to be consistent with all the applicable management direction of the revised plan, except for new standards and guidelines for wildlife, which address landscape connectivity, endemic terrestrial mammals, northern goshawk, and American marten. These new standards and guidelines were implemented in a manner that was least disruptive to the design

and implementation of the project. The extent to which these measures were incorporated was determined through review by an interagency implementation team consisting of the National Marine Fisheries Service (NMFS), Environmental Protection Agency, U.S. Fish and Wildlife Service (USFWS), and pertinent state agencies.

Development of Alternatives

Each alternative presented in this Supplemental Draft EIS represents a different response to the issues discussed in Chapter 1. Three action alternatives were developed that meet the stated purpose and need of the project. Each action alternative consists of a site-specific proposal developed through intensive interdisciplinary team evaluation of timber harvest unit and road design based on ground verification of all units and roads considered, along with 1991 color aerial photos, topographic maps, and a large quantity of available resource data in Geographic Information System (GIS) format.

Scoping for the Control Lake Project began in June 1993. The Interdisciplinary (ID) Team reviewed and analyzed the issues developed during scoping and identified the significant issues described in Chapter 1. Options for addressing the issues were discussed and areas of overlap among methods of addressing issues were examined by the ID Team. Issues identified as significant were categorized according to whether they: (1) are dealt with by land use allocations at the Forest Plan level; (2) will be addressed through implementation of standards and guidelines defined by the Forest Plan; (3) can be addressed through project-specific mitigation measures; (4) can be addressed through unit allocation under all or most alternatives; (5) should be used to drive or partially drive an alternative; or (6) are beyond the scope of this EIS. The issues placed in categories 4 and 5 were the primary factors considered by the ID Team in the development of the frameworks for the action alternatives.



Concurrent with scoping and the ID Team review of scoping issues, logging and transportation engineers and resource specialists from the ID Team developed a detailed Logging System and Transportation Plan that was specific to the Control Lake Project Area and consistent with the TLMP Revision Supplement to the Draft EIS (TLMP Draft Revision, 1991a). This plan was based on previous logging and transportation system plans available for portions of the Project Area, updated topographic maps, 1991 aerial photos, and the available GIS data. In developing the plan, the ID Team identified harvest unit boundaries for all suitable and available commercial forest land in the Project Area, including those areas accessible only by helicopter, and identified the road system required to access these lands.

The ID Team then conducted an intensive review of the Logging System and Transportation Plan and identified how much area could be harvested at this time consistent with Forest Plan standards and guidelines. The major factors limiting the number of potential harvest units available for allocation were: (1) adjacency; (2) cumulative visual disturbance; and (3) cumulative watershed effects. Based on this review, 333 harvest units and associated roads, representing one possible configuration, were identified. The 333 harvest units in the initial unit pool covered 16,170 acres.

These 333 harvest units represented the pool of units available for allocation to the action alternatives. Available aerial photos, topographic maps, and GIS plots and data for each of these units were reviewed and each unit was ground-verified by a team of specialists during summer 1993. Ground verification included preliminary flagging of unit boundaries, including buffers, and observations regarding watershed, soils, caves, sensitive plants, fish and wildlife habitat and presence, and visual, recreation, and cultural resources. Preliminary road routes were also examined for feasibility and flagged by road locators. Based on ground verification,

83 units were deferred or eliminated from consideration during this study for a variety of reasons. These reasons included very high mass movement soils, stands having less than 8,000 board feet of timber volume per acre, adjacency, and other factors. Many of these units would be available in future entries. In addition, the boundaries of most units were modified (generally the units were made smaller) and the locations of most roads were changed based on what was observed on the ground.

The resulting pool of units was reduced from 333 units to 250 units. The initial unit pool acreage was dropped from 16,170 acres to 9,409 acres, or 42 percent. The unit pool was reduced again between the Draft EIS and the Supplemental Draft EIS to reflect the 1997 TLMP Revision. This new unit pool is now 4,510 acres and includes 123 units. The alternatives considered in detail in the Supplemental Draft EIS have been redesigned to be consistent with the 1997 TLMP. A minor exception is Alternative 10, which would require boundary adjustments to two units. Appendix C of the Draft EIS provides a summary of the characteristics of all harvest units in the initial project unit pool (250 units). It also provides an accounting of the acreages dropped from the suitable timber base or deferred, following verification. Unit and road design cards were provided in Appendices F and G of the Draft EIS, and a sample of the integrated silvicultural prescriptions for an individual unit was provided in Appendix H of the Draft EIS. Unit cards that have been substantially revised since the Draft EIS are presented in Appendix C of the Supplemental Draft EIS.

Ecosystem Management

Ecosystem management is a concept of natural resources management wherein National Forest activities are considered within the context of economic, ecological, and social interactions within a defined area or region over both short- and long-term. Ecosystem management is applied at several scales including the landscape level and the stand level. During field work, observations on vegetation, stand, and wildlife habitat characteristics were made in each harvest unit. Subsequent to the field season the Control Lake ID Team used these observations in conjunction with landscape-level considerations to subdivide the Control Lake Project Area into a variety of landscape zones.

Definition of these landscape zones considered such aspects as the amount, distribution, and fragmentation of old-growth forests; the level and distribution of previous timber harvest and roading, travel, and dispersal corridors between zones that can be used by animals; the existing and potential road network for accessing timber; subsistence uses; visually sensitive areas; and important recreation areas. The landscape zones also considered the recommendations of the VPOP Committee on such aspects as small, medium, and large Habitat Conservation Areas (HCA's). The landscape level considerations included the characteristics of the Control Lake Project Area itself as well as its relationship to adjacent areas such as Central Prince of Wales, Karta Wilderness, and private land along Big Salt Lake. Consideration was given to social factors (including subsistence use, visual concerns, and recreation) and proposed land use designations in the development of landscape zones. The 20 landscape zones defined by the ID Team are described in Table 2-1 and their locations are shown on Figure 2-1 (Maps 1 and 2).

During the ID Team review process, each timber harvest unit was individually evaluated with regard to its specific characteristics and its location within each landscape zone. Using these observations, the ID Team applied one of nine different silvicultural prescriptions to individual settings within each timber harvest unit. These silvicultural prescriptions range from clearcuts to partial cuts, to small group and individual tree selection. All prescriptions leave some level of structure within a unit. Structure is provided by retaining some combination of understory

Table 2-1
Control Lake Project Area Landscape Zones

Landscape Zones	Description
1. Honker Watershed	The Honker Watershed (92,513 acres) is the largest division in the Control Lake Project Area. It contains several other landscape zones including the Honker Block, Honker Scenic Corridor, Upper Cutthroat Lakes, Drumlin Field, and Rio Roberts Research Natural Area. The Honker Watershed is connected to adjacent areas by the Baird Peak, Rio Roberts, and Angel Lake Late-successional corridors. Its important values and functions include watershed and fisheries, and wildlife habitat. It was defined because of the importance of the Thorne River and Hatchery Creek Watersheds for anadromous fish and to respond to the issue that the entire Honker Watershed should be protected from timber harvest.
2. Honker Block	The Honker Block (43,963 acres) is contained within the Honker Watershed. This block provides a core area of unfragmented old-growth habitat where significant populations of old-growth dependent species can be maintained. These populations can provide immigrants to adjacent areas that have experienced extensive timber harvest as these areas undergo changes from early- to late-successional habitats. The Honker Block is connected to adjacent areas by the Goshawk Post-fledgling Area, Baird Peak, Rio Roberts, Balls Lake, and Angel Lake Late-successional corridors. It is contiguous with the Sweetwater Lake/Hatchery Creek old-growth habitat area identified in the ROD for the Central Prince of Wales (CPOW) EIS. Together, the Honker Block and Sweetwater Lake/Hatchery Creek area produce a very large old-growth block.
3. Honker Scenic Corridor	The Honker Scenic Corridor (19,783 acres) is contained within the Honker Block and includes the Scenic/Recreational River LUD defined by the TLMP Draft Revision Supplement plus an additional 1/4 mile (on each side of the corridor) as defined in the 1984-1989 Long-term Sale EIS. The Honker Scenic Corridor provides recreational experiences such as canoeing, hiking, and scenic enjoyment. The Honker Scenic Corridor also serves as a late-successional corridor linking the Honker Block to the Sarkar Lakes Block in the CPOW Project Area. Corridors provide old-growth habitat which allows old-growth dependent species to migrate between larger areas of old-growth habitat such as small, medium, and large old-growth blocks.
4. Baird Peak Late-successional Corridor	This corridor (2,105 acres) connects the Honker Block with the Baird Peak Block in the CPOW Project Area. Corridors provide old-growth habitat which allows old-growth dependent species to migrate between larger areas of old-growth habitat such as small, medium, and large old-growth blocks.

Table 2-1 (continued)
Control Lake Project Area Landscape Zones

Landscape Zones	Description
5. Goshawk Post-fledgling Area (PFA) Late-successional Corridor	This corridor (1,624 acres) connects the Honker Block with the goshawk PFA in the northwestern corner of the Project Area. Corridors provide old-growth habitat which allows old-growth dependent species to migrate between larger areas of old-growth habitat such as small, medium, and large old-growth blocks.
6. Goshawk PFA Block	The Goshawk PFA (2,825 acres) Block lies in the northwestern corner of the Project Area and includes the PFA identified for the goshawk nest discovered in the vicinity. It serves as a small old-growth block and connects with the CPOW corridor that runs between the Staney Creek and Sweetwater Lake/Hatchery Creek Blocks.
7. Upper Cutthroat Lakes	This zone (2,960 acres) corresponds with the area identified by the Honker Divide Management Plan as being removed from the regulated timber base. It provides significant recreational, visual, wildlife, and aquatic resources.
8. Drumlin Field	This zone (13,609 acres) corresponds with the area generally between the lower Thorne River and the 30 Road where the topography and vegetation are controlled by drumlins. This area has a relatively low elevation plus natural fragmentation. These characteristics increase the value of the drumlin field as winter range and habitat for old-growth species. Additionally, the depressions between the numerous drumlins create a variety of wetland and aquatic habitats.
9. 30 Road Corridor	This corridor (5,323 acres) runs along the 30 Road from the Control Lake junction to Thorne Bay. Presently this travel corridor is relatively unharvested. Though not classified as a high-priority travel route, it is identified here to address the visual and recreational issues associated with its unharvested characteristics and the access it provides to the lower Thorne River and other creeks that the 30 Road crosses.
10. Rio Roberts Watershed	This zone (7,170 acres) is identified to address a number of issues regarding the Rio Roberts Watershed, including the fact that it is essentially unharvested and unroaded old-growth habitat, could serve as a control watershed, and contains the Rio Roberts Late-successional Corridor.
11. Rio Roberts Late-successional Corridor	This corridor (2,791 acres) is contained almost completely within the Rio Roberts Watershed and connects the Honker Block with the western portion of the Karta Wilderness Block to the south.
12. Rio Roberts Research Natural Area (RNA)	The Rio Roberts RNA (1,605 acres) boundary is defined by the TLMP Revision (1997). The RNA contains old-growth habitat wetland and riverine complexes and is entirely within Drumlin Field. This landscape zone sustains a variety of old-growth and aquatic species.

Table 2-1 (continued)
Control Lake Project Area Landscape Zones

Landscape Zones	Description
13. Angel Lake Late-successional Corridor	This corridor (2,096 acres) is in the southeast corner of the Project Area and connects the Honker Block with the eastern portion of the Karta Wilderness Block.
14. Balls Lake Late-successional Corridor	This corridor (3,356 acres) connects the Honker Block, in the vicinity of Balls Lake, with the Kogish Mountain Corridor.
15. Kogish Mountain Late-successional Corridor	This zone (9,267 acres) represents a combination of a late successional corridor and small old-growth block. It connects the old-growth and late-successional habitats in the eastern portion of the Project Area with those in the western portion. A small block of old-growth, the Election Creek Block, is identified in an unharvested portion of the upper valley.
16. Western Peninsula	The Western Peninsula (35,106 acres) provides important wildlife habitat. Because of its high degree of natural fragmentation, old-growth patches in the zone have high importance. The area is mostly unroaded and receives extensive subsistence use by the residents of Klawock and Craig using marine access. There are also cultural, visual, and recreational resources associated with the western shoreline. It includes the area known as the Elevenmile area.
17. Elevenmile Late-successional Corridor	This corridor (1,453 acres) lies within the Western Peninsula and connects the Kogish Mountain Corridor with the Elevenmile Block in the western portion of the Project Area.
18. Elevenmile Block	The Elevenmile Block (5,901 acres) is located within the Western Peninsula zone and represents a small old-growth block in the southeastern portion of that area. It represents the largest area of moderate volume old-growth habitat on the Western Peninsula.
19. Western Shoreline Late-successional Corridor	This corridor (5,508 acres) lies within the Western Peninsula and connects the Elevenmile Block with the Salt Lake Bay Block and beyond it to the Staney Creek Block in the CPOW Project Area.
20. Salt Lake Bay Block	This block (5,092 acres) corresponds with the Semi-primitive Recreation LUD defined by the TLMP Draft Revision Supplement (1991a) around Salt Lake Bay and represents a small old-growth block. The Semi-Remote Recreation LUD in this area has been substantially expanded in the TLMP Revision (1997).

Figure 2-1
Map of Landscape Zones

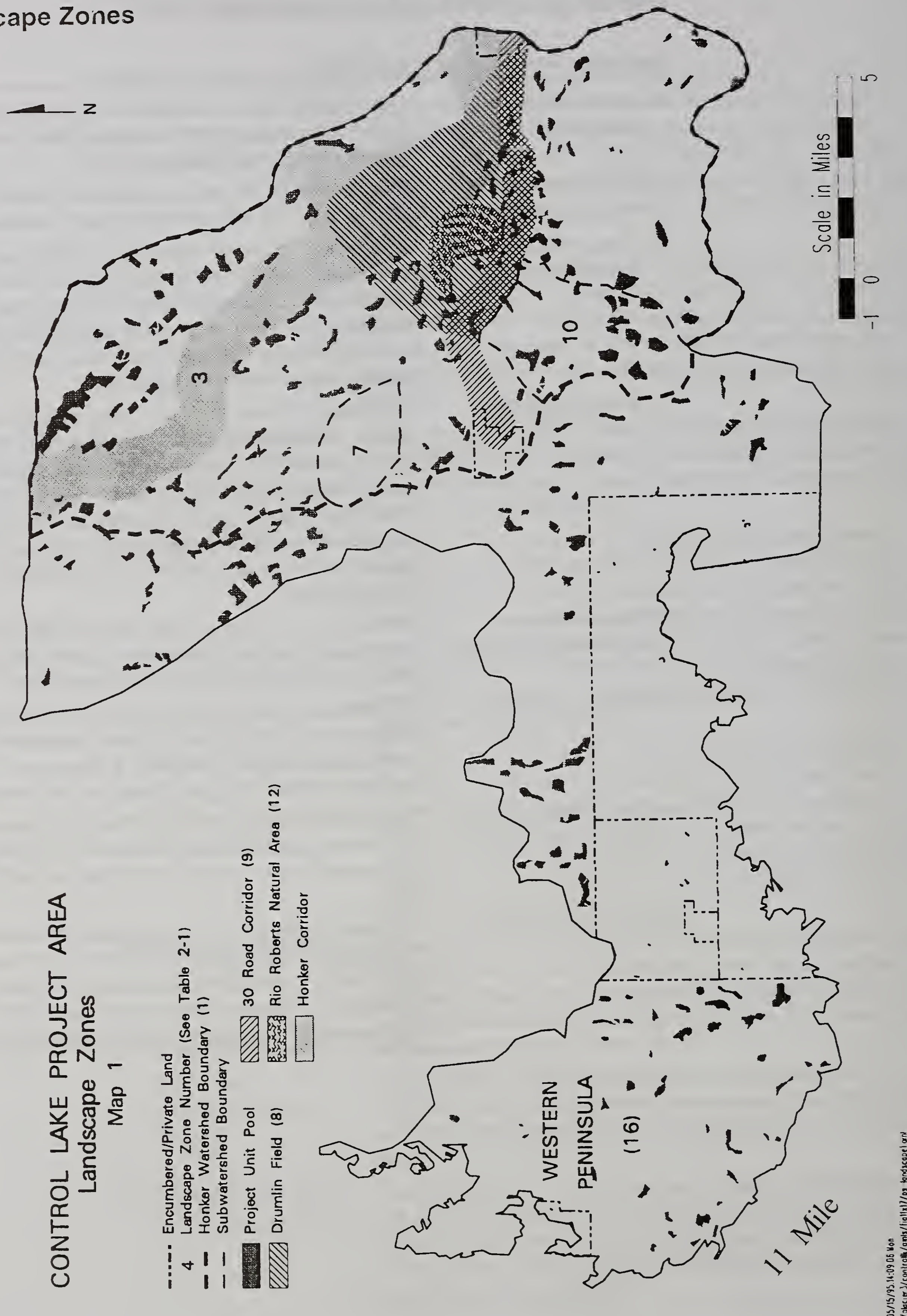
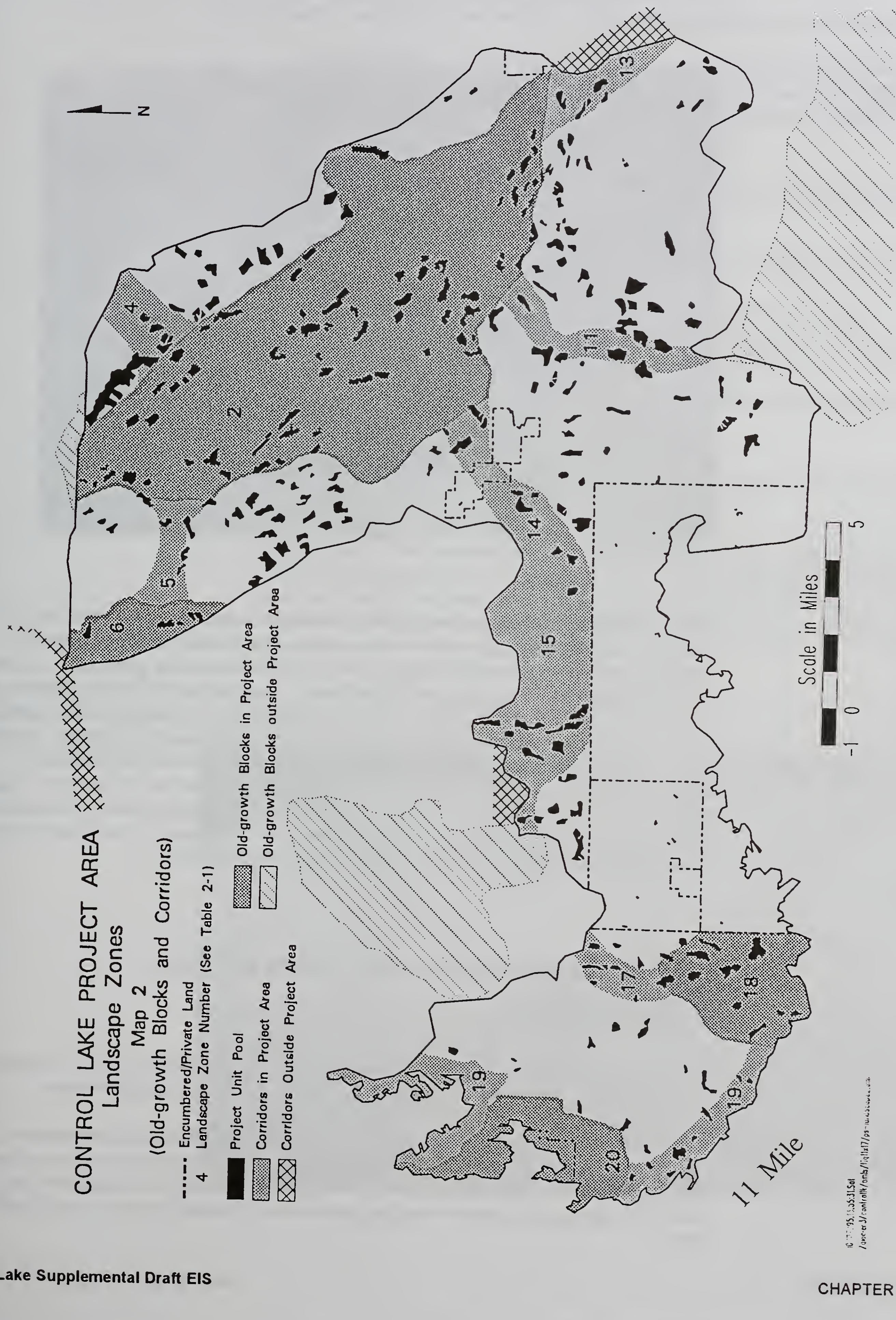
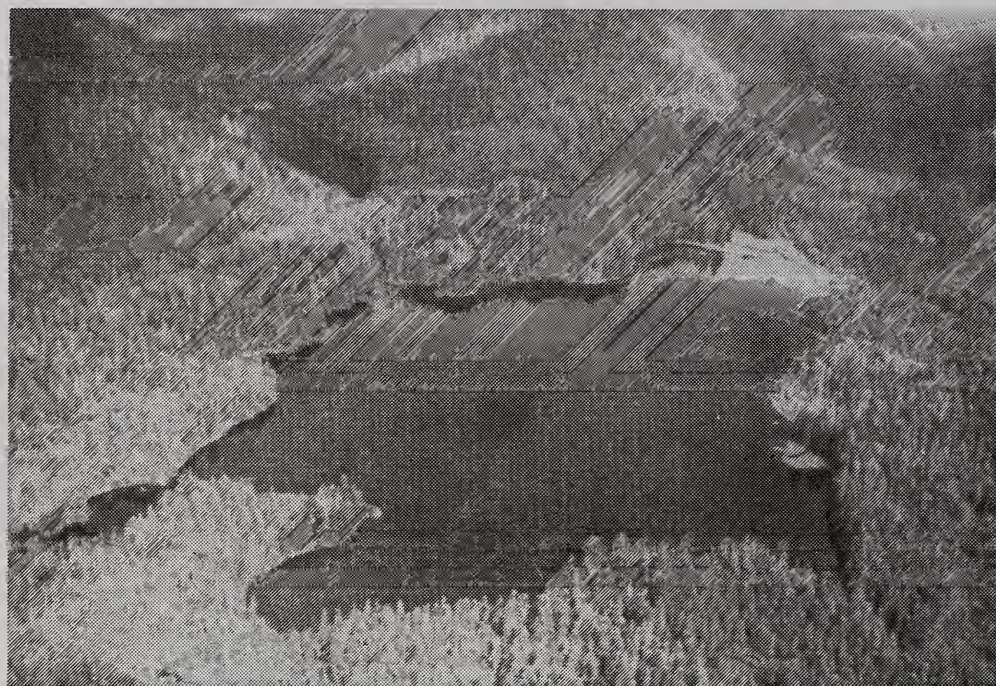


Figure 2-1
Map of Landscape Zones



shrubs and trees, unmerchantable trees, merchantable trees, and snags. These structural elements provide foraging, resting, reproductive, living, and dispersal habitat for a variety of plant and animal species and contribute to the maintenance of VPOP across the landscape.

Lower and Upper Cutthroat Lakes



At the stand level, the intention is to use partial cutting or selective harvest where the landscape zone or other site factors indicate there is high value in doing so, and silvicultural knowledge and the recommended logging system indicate that it has a good chance of succeeding. Within landscape zones that provide particularly important wildlife habitat, harvest units generally received partial cutting prescriptions. In individual cases, concern about blowdown, mistletoe infection, or logging system constraints resulted in clearcut prescriptions. In other landscape zones, harvest units generally received some form of clearcut prescription. In individual cases, concern about the level of previous harvest or the lack of structure or snags in the specific area resulted in partial cutting prescriptions. These prescriptions are universally applied to each specific unit within each alternative in which it appears. Consequently, these ecosystem management principles are applied in all action alternatives.

Items Common to All Alternative Frameworks

The ID Team reviewed the ground-verified pool of units and allocated them to the alternative frameworks. Items common to the frameworks of all alternatives are identified below.

Each action alternative considered for detailed study meets the stated purpose and need of the project. The stated purpose and need is to make timber available from the Control Lake Project Area to the Ketchikan Area Independent Sale Program, in a manner that is consistent with the Forest Plan management direction/emphasis and the desired future condition of the TLMP (1997).

Each alternative complies with such Forest Service planning documents as the 1990 Resources Planning Act, the Alaska Regional Guide, and the TLMP (1997).

Each alternative complies with Sec. 103(e) of TTRA which states that the Secretary shall:

> . . . maintain a buffer zone of no less than 100 feet in width on each side of all Class I streams in the Tongass National Forest, and on those Class II streams which flow directly into Class I streams, within which commercial timber harvesting shall be prohibited. . .

With minor adjustments for Alternative 10, each alternative is consistent with the standards, guidelines, and land allocations of the 1997 TLMP.

- Each individual unit proposed for harvest by any of the action alternatives meets the TLMP standards and guidelines for riparian management.
- No timber will be harvested within the 1,000-foot shoreline buffer (TLMP, 1997).
- Collectively, all units meet the TLMP objective to provide sufficient wildlife habitat to contribute to the maintenance of viable populations of wildlife species.
- All units and roads will meet the visual quality objectives (VQO's) adopted under the 1997 TLMP.

Individual harvest units that exceed 100 acres comply with current regional direction in the Alaska Regional Guide, which states that:

> One-hundred acres is the maximum size of created openings to be allowed for the hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under specific conditions. Recognizing that harvest units must be designed to accomplish management goals, created openings may be larger where larger units will produce a more desirable contribution of benefits.

Clearcut

This statement is designed to comply with legal limitations imposed on the maximum size of created openings as specified by the National Forest Management Act of 1976 (NFMA). The specific conditions listed in the Alaska Regional Guide include considerations for topography, condition of adjacent openings, effect on water quality or quantity, effects on wildlife and fish habitat, regeneration requirements, transportation, economic considerations, and harvest system requirements. Also addressed are natural and biological hazards such as windthrow, insect or disease problems, and visual absorption capacity. Any unit or combination of units larger than 150 acres for this project requires approval of the Regional Forester. Only 4 units exceed 100 acres and no clearcut units exceed 150 acres in the action alternatives. Only 2 of the 4 units exceeding 100 acres, actually have created openings exceeding 100 acres because of partial cutting and leave islands.

Ecosystem management opportunities were considered and are incorporated into all alternatives as described above. These opportunities are available both at the landscape level (e.g., a VCU, watershed, or viewshed) and at the stand level (e.g., individual harvest unit). Some of the opportunities that are responsive include:

Landscape level:

- dividing the Project Area into landscape zones with varying values and functions and then maintaining those values and functions to varying degrees in all alternatives
- maintaining large, unfragmented blocks of old-growth forest
- minimizing the amount of edge by designing larger harvest units
- identifying corridors that connect old-growth blocks and use beach and estuary fringe and stream buffers to the extent possible

Stand level:

- applying silvicultural prescriptions based on the individual stand characteristics and position of the unit in relationship to landscape zones
- retaining snags in harvest units (where safety regulations allow)
- retaining individual live reserve trees or small patches of live reserve trees in clearcuts
- using selection harvest systems for maintenance of visual quality and wildlife habitat
- using shelterwood harvest to maintain the cedar component
- maintaining large down logs in harvest units
- using silvicultural treatment of second growth to enhance wildlife habitat

With the exception of two units in Alternative 10 which would require trimming, no alternative proposes to harvest timber in any of the non-development LUD's including the Honker Divide Old-growth Reserve, the Rio Roberts Old-growth Reserve, the Election Creek Old-growth Reserve, the Rio Roberts RNA, the Elevenmile Semi-remote Recreation Area, and the Thorne River/Hatchery Creek Wild and Scenic River.

Alternatives Considered but Eliminated from Detailed Study

This section briefly describes alternatives that were considered but eliminated from detailed study. Alternatives 2, 3, 4, 5, 6, 7, 8, and 9 are eliminated from detailed study and receive no further discussion in this Supplemental Draft EIS. In the Draft EIS published in October 1995, Alternatives 2, 7, 8, and 9 were analyzed in detail in the main text and Alternatives 4 and 6 were analyzed in detail in Appendix B.

Alternative 2

Under Alternative 2, timber volume would be provided at the maximum level that could be allowed under full implementation of Alternative P of the TLMP Draft Revision (1991a). The harvest level would be limited only by the application of the Forest Plan Management Prescriptions, Standards and Guidelines, and BMP's. The 250 units in this alternative represent the total initial project unit pool that remained after field investigation. Implementation of Alternative 2 resulted in the harvest of 9,409 acres producing approximately 233 MMBF of net sawlog and utility volume. This volume included approximately 12 MMBF from road right-of-way (ROW) clearing. It required approximately 218 miles of new road and 8 miles of reconstructed road to access the harvest units. This alternative was considered in detail in the Draft EIS, but has been deleted from detailed study in the Supplemental Draft EIS because of the degree of inconsistency it would have with the 1997 TLMP.

Alternative 3

Alternative 3 was referred to as the Proposed Action during scoping and was included on the map accompanying the scoping package. The chosen units were widely distributed across the Project Area. They were intended to draw attention to sensitive areas and demonstrate that all areas available for harvest under the Forest Plan were under consideration in order to solicit scoping comments. This alternative resulted in 137 harvest units providing 173 MMBF of net sawlog plus utility volume. This volume included approximately 7 MMBF from road ROW clearing. This alternative was not considered in detail because the choice and distribution of units did not form logical groups for harvest and did not respond to specific issues developed during scoping.

Alternative 4

The framework for Alternative 4 emphasizes timber economics and conventional cable yarding methods. Criteria include 1 MMBF of timber volume per mile of road and no helicopter units except when they are immediately adjacent to the road system. Units with a large component of Alaska yellowcedar were included. It emphasizes a positive net economic return for the proposed harvest units by attempting to minimize logging and road construction costs. This alternative resulted in 105 harvest units on 4,555 acres providing 129 MMBF of net sawlog plus utility volume. This volume included approximately 5 MMBF from road ROW clearing. It required 96 miles of road to access the harvest units. This alternative was not considered in detail because it would reduce the economic viability of future entries. By harvesting only the highest volume units in this entry, subsequent entries would be less economically viable. More information on this alternative was presented in Appendix B of the Draft EIS.

Alternative 5

Alternative 5 uses the landscape zones as a basis for alternative design. It maintains the value and function of the zones of highest concern or sensitivity. No harvest is scheduled in Honker Divide "ridge-to-ridge," north of Forest Road 30, within the Rio Roberts Watershed, and the Western Peninsula (Elevenmile Area). All other areas would be entered at the Forest Plan implementation level. This alternative resulted in 62 harvest units on 2,281 acres providing 68 MMBF of net sawlog plus utility volume. This volume included approximately 2 MMBF from road ROW clearing. It required 59 miles of road to access the harvest units. This alternative was not considered in detail because it is similar to Alternatives 6 and 10, which respond to similar issues.

Alternative 6

Like Alternative 5, this alternative uses the landscape zones as a basis for design. Harvest is scheduled to maintain the function of all landscape zones throughout a harvest rotation. It schedules timber harvest in all landscape zones except old growth blocks. Regeneration harvests were scheduled to evenly meter out removal of remaining suitable old growth over time. This alternative resulted in 99 harvest units on 4,021 acres providing 106 MMBF of net sawlog plus utility volume. This volume included approximately 4 MMBF from road ROW clearing. It required 93 miles of road to access the harvest units. This alternative was not considered in detail because of the degree of inconsistency it would have with the 1997 TLMP and because most of its framework is captured by Alternatives 10 and 11. However, more information on this alternative was presented in Appendix B of the Draft EIS.

Alternative 7

Alternative 7 sought to provide 187 MMBF while responding to scoping concerns related to entry into the Western Peninsula and Upper Rio Roberts Watershed. It allowed no entry into these two areas of concern, but included all units within the project unit pool from other areas, including the Honker Divide. It resulted in the harvest of 7,399 acres in 197 harvest units providing approximately 180 MMBF of net sawlog and utility volume. This volume included approximately 9 MMBF from road ROW clearing. Alternative 7 required approximately 173 miles of new road and 8 miles of reconstructed road to access the harvest units. This alternative was considered in detail in the Draft EIS, but has been deleted from detailed study in the Supplemental Draft EIS because of the degree of inconsistency it would have with the 1997 TLMP Revision, particularly in the Honker Divide.

Alternative 8

This alternative sought to provide 187 MMBF while responding to scoping concerns related to entry into the core of the Honker Divide area and most of the Western Peninsula. The alternative would harvest all potential units in the initial project unit pool except for a core group in the Honker Divide area. It resulted in the harvest of 7,107 acres in 186 harvest units providing approximately 184 MMBF of net sawlog and utility volume. This volume included approximately 9 MMBF from road ROW clearing. Alternative 8 required approximately 169 miles of new road and 8 miles of existing road needing reconstruction. This alternative was considered in detail in the Draft EIS, but has been deleted from detailed study in the Supplemental Draft EIS because of inconsistency it would have with the 1997 TLMP Revision.

Alternative 9

Alternative 9 was designed to minimize harvest in the Honker Block, avoid harvest in the Rio Roberts corridor, minimize harvest in the Western Peninsula, and allow harvest at the full implementation level of Alternative P in the TLMP Draft Revision (1991a). It resulted in the harvest of 5,123 acres in 135 harvest units providing approximately 130 MMBF of net sawlog and utility volume. This volume included approximately 6 MMBF from road ROW clearing. Alternative 9 required approximately 115 miles of new road and 8 miles of road reconstruction. This alternative was considered in detail in the Draft EIS, but has been deleted from detailed study in the Supplemental Draft EIS because of inconsistency it would have with the 1997 TLMP Revision.

Alternatives Considered in Detail

Four alternatives are considered in detail. Alternative 1 would not implement any action alternatives; the Control Lake Project Area would remain subject to natural changes only. This alternative represents the existing condition with which all other alternatives are compared. Alternatives 10, 11, and 12 represent different means of satisfying the purpose and need by harvesting timber while responding with different emphasis to the various issues.

Foldout color maps of all alternatives considered in detail are provided at the end of Chapter 2. A foldout color map showing the access strategy for the action alternatives is also provided at the end of Chapter 2. Additionally, a large-scale map of the Project Area with all units and roads in the revised unit pool is included with this Supplemental Draft EIS. Large-scale maps of these alternatives are also available in the Project Planning Record.

Alternative 1 Framework (No Action)

Alternative 1, also called the No Action Alternative, would result in no timber (No Action) harvest or road construction in the Control Lake Project Area that is additional to the timber harvest already cleared by the 1989-1994 EIS. Under this alternative, replacement timber volume would probably not be available from somewhere else within the Ketchikan Area at this time. This alternative serves as a baseline against which to measure the effects of the action alternatives.

Consistency with the 1997 Forest Plan

Alternative 1 is consistent with the 1997 Forest Plan in the short-term. In the long-term, No Action would not likely be consistent, especially in the LUD's that program timber harvest. This would likely require a Forest Plan amendment.

Resource Outputs

There are no new timber harvest outputs associated with this alternative.

Economic Outputs

Because Alternative 1 would result in no new timber harvest or road construction beyond that which is already approved, there would be no timber-related economic outputs. Additional receipts to the State of Alaska would be foregone and no new timber jobs would be created.

Environmental Consequences

A summary of the environmental consequences of implementing Alternative 1 by significant issue is presented below.

Issue 1—Honker Divide

Under Alternative 1, no further road building or timber harvest would occur in the Honker Divide area. Recreational and subsistence access to the area and values would remain the same as at present. The Thorne River/Hatchery Creek canoe route would remain isolated. The high wildlife habitat value of this area associated with the large unfragmented block of old growth would remain the same as at present.

Issue 2—Recreation and Visual Quality

Under Alternative 1, visual quality and recreation and tourism opportunities would remain unchanged in the Project Area.

Issue 3—Subsistence

Subsistence use of the Project Area would be affected only by previous timber harvest and road development under Alternative 1. No timber harvest or road construction would occur in the 25,723 cumulative acres of subsistence use areas in the Project Area used by 15 percent or more of a rural community's households.

A significant possibility of a significant restriction of subsistence use of deer, black bear, and marten would occur in some areas related to past timber harvest and high demand.

Issue 4—Wildlife Habitat and Biodiversity

All effects on habitat and biodiversity would be avoided, resulting in no change from existing conditions except for those changes resulting from natural factors such as plant succession.

Issue 5—Fish Habitat and Water Quality

No effects on fish habitat or water quality are expected other than those caused by two factors independent of the Control Lake Project. First, there would be continued slight degradation of fish habitat resulting from lack of large woody debris recruitment caused by past timber harvesting to the stream bank. Second, existing fish habitat enhancement projects are expected to result in increased fish habitat capability.

Issue 6—Timber Economics and Supply

Alternative 1 would result in no timber-related economic outputs and therefore would not provide any direct return to the U.S. Treasury. The current timber supply in the Control Lake Project Area would be unaffected. No economic return to the State of Alaska due to timber harvest would occur. No timber jobs would be created in the Control Lake Project Area until another timber project is evaluated and implemented.

Lack of timber harvest activity in the Project Area would likely result in a slowdown at log processing facilities and economic impacts on Prince of Wales Island residents and independent timber contractors. Economic impacts would most likely occur to some residents of Thorne Bay, Coffman Cove, Craig, Klawock, Naukati, and Ketchikan who depend directly or indirectly on timber harvesting on Prince of Wales Island.

Approximately 22, 786 acres of suitable old growth would remain in the Project Area after implementation of Alternative 1.

Issue 7—Karst and Cave Resources

Alternative 1 would have no effect on the karst or cave resources of the Project Area.

Alternative 10 Framework

This alternative does not schedule harvest in the Honker Divide ("ridge-to-ridge") north of Forest Road 30, in the upper Logjam Creek area, in Rio Roberts Watershed, or in the Western Peninsula. It uses a harvest scheduling process similar to that described in Alternative 6. Alternative 10 attempts to emphasize community-based, value-added products by choosing units that would be more easily harvested by independent and small operators. Units in this alternative minimize road construction, are smaller, and use conventional logging systems. This alternative was independently developed by a group consisting of environmental organization representatives, independent timber contractors, Alaska natives, educators, business owners, and fishermen, most of which are residents of Prince of Wales Island.

Consistency with the 1997 TLMP Revision

All proposed units and roads are consistent with LUD changes in the new Forest Plan with the exception of two units in VCU 597.1 (597.1-401 and 597.1-421), which are partially within an Old-Growth Habitat LUD. Implementation of this alternative would require a Forest Plan amendment, unless the units are modified. Several short segments of road in VCU 596 also cross the Old-Growth LUD; however, these roads are not inconsistent unless feasible alternatives can be found.

Resource Outputs

Implementation of Alternative 10 would result in the harvest of 1,281 acres in 38 harvest units producing approximately 38 MMBF of net sawlog and utility volume. This volume includes

approximately 2 MMBF from road ROW clearing. Average unit size would be about 33.7 acres and 1 unit would exceed 100 acres. Of this harvest, 140 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned (to varying degrees) for all units proposed for clearcutting. To implement this harvest, approximately 30 miles of road would be constructed or reconstructed.

Preliminary implementation planning indicates that Alternative 10 would be sold in 11 sales ranging in size from 0.2 to 5.5 MMBF.

No new LTF's would be needed. Timber harvest would be hauled to existing facilities at Klawock, Winter Harbor, Thorne Bay, or elsewhere.

Economic Outputs

Preliminary economic analysis indicates that Alternative 10 would produce an overall net stumpage value of $129.53 per MBF at early 1995 timber values. The present net value (PNV) of Alternative 10 was estimated to be $2.9 million. Payments to the State of Alaska resulting from Alternative 10 were estimated at $2.2 million. Average annual direct jobs created were estimated at 54 over 4 years.

Environmental Consequences

A summary of the environmental consequences of implementing Alternative 10 by significant issue is presented below.

Issue 1—Honker Divide

No changes to the unroaded character of the Honker Divide would occur. Overall roaded access and related recreation and subsistence use would not increase. The Thorne River/ Hatchery Creek canoe route would remain isolated.

Issue 2—Recreation and Visual Quality

Changes in the visual quality of the West Coast Waterway would be very slight. Changes in the visual quality from the Control Lake Cabin would be slight. No changes in the visual quality from the Eagle's Nest Campground (Balls Lake) would occur. Changes in the visual quality along the Forest Highway #9 (30 Road) corridor would be slight to moderate. However, two units in this viewshed may have to be modified before the new Forest Plan (1997) Visual Quality Objective (VQO) can be met. No changes in the visual quality from the Cutthroat Lakes area would occur. No changes in the visual quality of the sensitive viewshed along the Thorne River-Hatchery Creek Canoe Route would occur.

Timber harvest would have minimal effects on existing and potential recreation sites. Timber harvest and road construction would result in a change of approximately 7,124 acres from unroaded to roaded Recreation Opportunity Spectrum (ROS) settings.

Issue 3—Subsistence

About 222 acres used by more than 15 percent of rural community households for deer hunting would be harvested.

Based on the wildlife analysis and existing harvest levels, deer habitat capability would be below that needed to support current total harvest levels, but would be above that needed to support rural harvests, indicating that there may be a need to restrict nonsubsistence users.

Black bear and marten habitat capabilities would be below needed populations in some areas and close to needed populations for the Project Area as a whole.

No roads would be built within 5 miles of the Elevenmile shoreline, which is an important subsistence use area.

Issue 4—Wildlife Habitat and Biodiversity

The major effect would be the harvest of 1,281 acres of wildlife habitats. This includes 1,124 acres of old-growth forest habitat (Volume Classes 4 to 7) or about 1 percent of the remaining old growth.

The 30 miles of road construction/reconstruction would provide new access into unroaded areas; however, road closures following harvest would minimize this effect. Because no new LTF's or logging camps would be required, additional habitat and disturbance impacts from these sources would be avoided.

Under the 1997 TLMP Revision, the expanded use of no-harvest LUD's would create an extensive old-growth retention strategy that would provide connectivity across northern Prince of Wales Island. As noted above, Alternative 10 would have only minor conflicts with this strategy.

The acreage of unfragmented old-growth patches greater than 10,000 acres in size would not be reduced; there would be 6,405 acres of patches 5,000 to 10,000 acres in size. The acreage of unfragmented interior old-growth patches greater than 1,000 acres would be decreased from 10,210 to 10,065 acres.

Sitka black-tailed deer habitat capability would be reduced by 1 percent and 2 harvest units in high quality winter range would be harvested.

Threatened or endangered species would not be affected.

The 1997 TLMP further subdivided Class III streams into Class III and Class IV streams. See the Glossary for the current definitions.

Issue 5—Fish Habitat and Water Quality

No measurable effects on fish and water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures. Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 372 acres was estimated due to timber harvest and road construction; (2) 637 acres of high hazard soils and 0 acres of very high hazard soils would be harvested; (3) up to 105 acres of riparian area (primarily along Class III streams) may be harvested (primarily selective harvest) outside of no-cut buffers. Additionally, roads would cross 10 Class I, 19 Class II, and 54 Class III/IV streams, and streamside vegetation would be removed along 25 miles of Class III/IV streams.

Issue 6—Timber Economics and Supply

Preliminary economic analysis indicates an overall net stumpage value of $129.53/MBF at early 1995 timber values. The PNV associated with this alternative is $2.9 million.

Approximately 21,505 acres of suitable old-growth would remain in the Project Area after implementation of Alternative 10.

Issue 7—Karst and Cave Resources

No harvest units or roads in this alternative were identified during field surveys as occurring on karst.

Alternative 11 Framework (Preferred Alternative)

This alternative was designed to be completely consistent with the 1997 Forest Plan Revision. It avoids harvest within all of the Old-Growth Habitat and Semi-Remote Recreation LUD's including the Honker Divide area, Rio Roberts Watershed, most of the Western Peninsula, and other areas. Alternative 11 reflects collaborative efforts between the Forest Service and other state and federal agencies.

Consistency with Anticipated 1997 Forest Plan Revision

All proposed units and roads are consistent with Land Use Designation changes anticipated in the new Forest Plan. Several short road segments in VCU 596 would cross an Old-Growth LUD; however, these roads are not inconsistent unless feasible alternatives can be found.

Resource Outputs

If Alternative 11 were implemented, it would result in the harvest of 3,612 acres in 98 harvest units producing approximately 94 MMBF of new sawlog and utility volume. This volume includes approximately 5 MMBF from road ROW clearing. Average unit size would be about 36.9 acres and 3 units would exceed 100 acres. Of this harvest, 903 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned to varying degrees for all units proposed for clearcutting. To implement this harvest, approximately 78 miles of road would be constructed or reconstructed.

Preliminary implementation planning indicates that Alternative 11 would be sold in 17 sales ranging in size from 0.2 to 13.1 MMBF.

No new LTF's would be needed. Timber harvest would be hauled to existing facilities at Klawock, Winter Harbor, Naukati, Thorne Bay, or elsewhere.

Economic Outputs

Preliminary economic analysis indicates that Alternative 11 would produce an overall net stumpage value of $89.69 per MBF at early 1995 timber values. The PNV of Alternative 11 was estimated to be $2.8 million. Payments to the State of Alaska resulting from Alternative 11 were estimated at $5.6 million. Average annual direct jobs created were estimated at 138 over 4 years.

Environmental Consequences

A summary of the environmental consequences of implementing Alternative 11 by significant issue is presented below.

Issue 1—Honker Divide

No changes to the unroaded character of the Honker Divide would occur. Overall roaded access and related recreation and subsistence use would not increase. The Thorne River/ Hatchery Creek canoe route would remain isolated but with a slight additional potential for wilderness-oriented recreationists to hear logging operations in the short-term and compete with road-oriented recreationists over the long-term.

Issue 2—Recreation and Visual Quality

Changes in the visual quality of the West Coast Waterway would be slight. Changes in the visual quality from the Control Lake Cabin would be low. Changes in the visual quality from the Eagle's Nest Campground (Balls Lake) would be low. Changes in the visual quality along Forest Highway #9 (30 Road) corridor would be slight to moderate. However, two units in this viewshed may have to be modified before the new Forest Plan (1997) VQO can be met. There

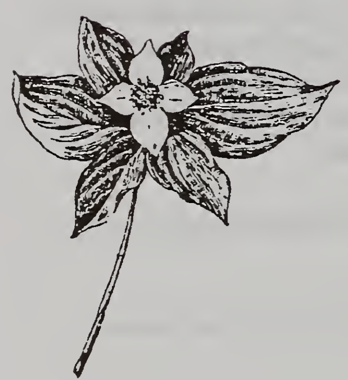
would be no changes in the visual quality from the Cutthroat Lakes area. Changes in the visual quality of the sensitive viewshed along the Thorne River-Hatchery Creek Canoe Route would be low.

Timber harvest would have minimal effects on existing and potential recreation sites. Timber harvest and road construction would result in a change of approximately 27,506 acres from unroaded to roaded ROS settings.

Issue 3—Subsistence

About 307 acres used by more than 15 percent of rural community households for deer hunting would be harvested.

Based on the wildlife analysis and existing harvest levels, deer habitat capability would be below that needed to support current total harvest levels, but would be above that needed to support rural harvests, indicating that there may be a need to restrict nonsubsistence users.



Black bear and marten habitat capabilities would be below needed populations in some areas and close to needed populations for the Project Area as a whole.

No roads would be built within 3 miles of the Elevenmile shoreline, which is an important subsistence use area.

Issue 4—Wildlife Habitat and Biodiversity

The major effect would be the harvest of 3,613 acres of wildlife habitats. This includes 3,199 acres of mapped old-growth forest habitat (Volume Classes 4 to 7) or about 4 percent of the remaining old growth.

The 78 miles of road construction/reconstruction would provide new access into unroaded areas; however, road closures following harvest would minimize this effect. Because no new LTF's or logging camps would be required, habitat and disturbance impacts from these sources would be avoided.

Under the 1997 TLMP Revision, the expanded use of no-harvest LUD's would create an extensive old-growth strategy that would provide connectivity across northern Prince of Wales Island. Alternative 11 would not include the harvest of any units or road construction that would conflict with this strategy.

The acreage of unfragmented old-growth patches greater than 10,000 acres in size would be reduced from 29,739 to 29,342; there would be 5,948 acres of patches 5,000 to 10,000 acres in size. The acreage of unfragmented interior old-growth patches greater than 1,000 acres would be decreased from 10,210 to 8,557 acres.

Sitka black-tailed deer habitat capability would be reduced by 3 percent and 18 harvest units in high quality winter range would be harvested.

Threatened or endangered species would not be affected.

Issue 5—Fish Habitat and Water Quality

No measurable effects on fish and water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures. Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 920 acres was estimated due to timber harvest and road construction; (2) 1,429 acres of high hazard soils

and 0 acres of very high hazard soils would be harvested; (3) up to 309 acres of riparian area (primarily along Class III streams) would be harvested (primarily selective harvest) outside of no-cut buffers. Additionally, roads would cross 29 Class I, 37 Class II, and 153 Class III/IV streams, and streamside vegetation would be removed along 41 miles of Class III/IV streams.

Issue 6—Timber Economics and Supply

Preliminary economic analysis indicates an overall net stumpage value of $89.69/MBF based on early 1995 timber values. The PNV associated with this alternative is $2.8 million.

Approximately 19,174 acres of suitable old growth would remain in the Project Area after implementation of Alternative 11.

Issue 7—Karst and Cave Resources

About 17 acres of units and roads in this alternative are on low-to-moderate vulnerability karst. No known caves or other significant features are included within the unit boundaries. No measurable effects on karst resources are expected due to implementation of mitigation measures.

Alternative 12 Framework

This alternative was designed to provide a maximum level of harvest consistent with the 1997 Forest Plan Revision. It avoids harvest within all of the Old-Growth Habitat and Semi-Remote Recreation LUD's including the Honker Divide area, Rio Roberts Watershed, most of the Western Peninsula, and other areas.

Consistency with Anticipated 1997 Forest Plan Revision

All proposed units and roads are consistent with Land Use Designation changes anticipated in the new Forest Plan. Several short road segments in VCU 576 would cross an Old-Growth LUD; however, these roads are not inconsistent unless feasible alternatives can be found.

Resource Outputs

If Alternative 12 were implemented, it would result in the harvest of 4,452 acres in 123 harvest units producing approximately 113 MMBF of net sawlog and utility volume. This volume includes approximately 6 MMBF from road ROW clearing. Average unit size would be about 36.2 acres and 4 units would exceed 100 acres. Of this harvest, 1,346 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned to varying degrees for all units proposed for clearcutting. To implement this harvest, approximately 98 miles of road would be constructed or reconstructed.

Preliminary implementation planning indicates that Alternative 12 would be sold in 20 sales ranging in size from 0.2 to 13.1 MMBF.

No new LTF's would be needed. Timber harvest would be hauled to existing facilities at Klawock, Winter Harbor, Naukati, Thorne Bay, or elsewhere.

Economic Outputs

Preliminary economic analysis indicates that Alternative 12 would produce an overall net stumpage value of $86.21 per MBF at early 1995 timber values. The PNV of Alternative 12 was estimated to be $2.8 million. Payments to the State of Alaska resulting from Alternative 12 were estimated at $6.8 million. Average annual direct jobs created were estimated at 168 over 4 years.

Environmental Consequences

A summary of the environmental consequences of implementing Alternative 12 by significant issue is presented below.

Issue 1—Honker Divide

Only slight changes to the unroaded character of the Honker Divide would occur. Overall roaded access and related recreation and subsistence use would increase slightly. The Thorne River/Hatchery Creek canoe route would remain isolated but with a slight additional potential for wilderness-oriented recreationists to hear logging operations in the short-term and compete with road-oriented recreationists over the long-term.

Issue 2—Recreation and Visual Quality

Changes in the visual quality of the West Coast Waterway would be slight. Changes in the visual quality from the Control Lake Cabin would be low. Changes in the visual quality from the Eagle's Nest Campground (Balls Lake) would be low. Changes in the visual quality along Forest Highway #9 (30 Road) corridor would be slight to moderate. However, two units in this viewshed may have to be modified before the new Forest Plan (1997) VQO can be met. There would be no changes in the visual quality from the Cutthroat Lakes area. Changes in the visual quality of the sensitive viewshed along the Thorne River-Hatchery Creek Canoe Route would be low.

Timber harvest would have minimal effects on existing and potential recreation sites. Timber harvest and road construction would result in a change of approximately 36,119 acres from unroaded to roaded ROS settings.

Issue 3—Subsistence

About 291 acres used by more than 15 percent of rural community households for deer hunting would be harvested. Roads would be built to within 1 mile of the Elevenmile shoreline, potentially creating conflicts between traditional subsistence users and new road-based users of this important subsistence area.

Based on the wildlife analysis and existing harvest levels, deer habitat capability would be below that needed to support current total harvest levels, but would be above that needed to support rural harvests, indicating that there may be a need to restrict nonsubsistence users.

Black bear and marten habitat capabilities would be below needed populations in some areas and close to needed populations for the Project Area as a whole.

Issue 4—Wildlife Habitat and Biodiversity

The major effect would be the harvest of 4,452 acres of wildlife habitats. This includes 3,956 acres of mapped old-growth forest habitat (Volume Classes 4 to 7) or about 5 percent of the remaining old growth.

The 98 miles of road construction/reconstruction would provide new access into unroaded areas; however, road closures following harvest would minimize this effect. Because no new LTF's or logging camps would be required, habitat and disturbance impacts from these sources would be avoided.

Under the 1997 TLMP Revision, the expanded use of no-harvest LUD's would create an extensive old-growth strategy that would provide connectivity across northern Prince of Wales Island. Alternative 12 would not include the harvest of any units or road construction that would conflict with this strategy.

Log tow

The acreage of unfragmented old-growth patches greater than 10,000 acres in size would be reduced from 29,856 to 29,342; there would be 5,948 acres of patches 5,000 to 10,000 acres in size. The acreage of unfragmented interior old-growth patches greater than 1,000 acres would be decreased from 10,210 to 7,828 acres.

Sitka black-tailed deer habitat capability would be reduced by 4 percent and 23 harvest units in high quality winter range would be harvested.

Threatened or endangered species would not be affected.

Issue 5—Fish Habitat and Water Quality

No measurable effects on fish and water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures. Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 1,179 acres was estimated due to timber harvest and road construction; (2) 1,655 acres of high hazard soils and 0 acres of very high hazard soils would be harvested; (3) up to 351 acres of riparian area (primarily along Class III streams) would be harvested (primarily selective harvest) outside of no-cut buffers. Additionally, roads would cross 39 Class I, 43 Class II, and 176 Class III/IV streams, and streamside vegetation would be removed along 48 miles of Class III/IV streams.

Issue 6—Timber Economics and Supply

Preliminary economic analysis indicates an overall net stumpage value of $86.21/MBF based on early 1995 timber values. The PNV associated with this alternative is $2.8 million.

Approximately 18,334 acres of suitable old growth would remain in the Project Area after implementation of Alternative 12.

Issue 7—Karst and Cave Resources

About 17 acres of units and roads in this alternative are on low-to-moderate vulnerability karst. No known caves or other significant features are included within the unit boundaries. No measurable effects on karst resources are expected due to implementation of mitigation measures.

Comparison and Evaluation of Alternatives

This section presents the environmental consequences of the alternatives in a comparative format. First, the alternatives are compared and evaluated relative to the significant issues identified in Chapter 1. Then at the end of this section, three tables are presented. In the first one, a summary of the physical and economic outputs of the alternatives are presented in Table 2-2. Next, the environmental consequences of the alternatives are summarized in Table 2-3. All numbers presented in these two tables are either absolute or relative to Alternative 1 as indicated. Finally, in Table 2-4 the alternatives are compared and evaluated relative to the landscape zones identified in Table 2-1 and Figure 2-1. For more detailed descriptions of the affected environment and the environmental consequences of the alternatives, refer to Chapters 3 and 4, respectively.

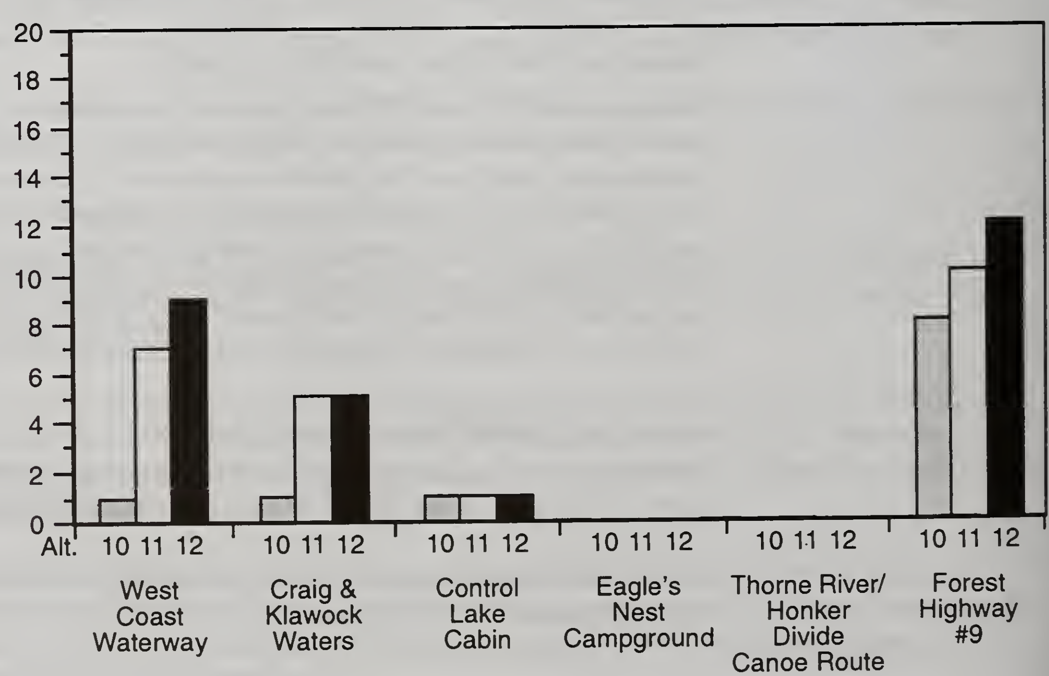
Issue 1—Honker Divide

Under Alternatives 10 and 11, changes to the unroaded character of the Honker Divide would not occur; the unroaded character would be only slightly affected under Alternative 12. Therefore, roaded access and related recreation and subsistence use would increase very slightly under Alternative 12, but remain nearly unchanged under Alternatives 10 and 11.

For Alternatives 11 and 12, there would be some potential for recreationists using the Thorne River/Honker Divide canoe route to hear logging activities. This potential is highest in Alternative 12.

The high wildlife habitat value of this area associated with the large unfragmented block of old growth would not be reduced under Alternatives 10 or 11, and would be very slightly reduced under Alternative 12.

Figure 2-2
Number of Units Seen from Priority Travel Routes and Use Areas



Issue 2—Recreation and Visual Quality

During the Project Area visual assessment, 11 Priority Travel Routes and Use Area viewsheds were identified. Among these, 6 are considered important for comparison because of their visual sensitivity and the presence of harvest units within them. The degree of change in the visual quality from these Priority Travel Routes and Use Areas is considered in relationship to the number of harvest units potentially affecting them. Figure 2-2 shows the number of units seen by the casual forest visitor from Priority Travel Routes and Use Areas.

The visual quality effects associated with all of these Priority Travel Routes and Use Areas is low to moderate and generally falls within standards and guidelines. However, two units in each of the alternatives may have to be modified before the new TLMP (1997) VQO along Forest Highway #9 (30 Road Corridor) can be met. Changes in the visual quality along Forest Highway #9 would be highest with Alternative 12 and lowest with Alternatives 10 and 11.

The alternatives would have minimal effects on existing and potential recreation sites. All action alternatives would result in a reduction in the area of unroaded ROS settings (Table 2-3), with Alternative 12 having the largest change and Alternative 10 having the smallest. For Alternative 12, timber harvest and road construction would result in a change of approximately 36,119 acres of unroaded to roaded ROS settings. For Alternative 10, timber harvest and road construction would result in a change of approximately 7,124 acres from unroaded to roaded ROS settings.

Issue 3—Subsistence

Deer hunting is the major aspect of subsistence use that is affected by timber harvest. Based on the wildlife analysis, Sitka black-tailed deer habitat capability in the Project Area would be reduced from 1 to 4 percent by the action alternatives (Table 2-3). Alternative 12 would have the greatest effect and Alternative 10 would have the least effect. Alternative 1 would result in no change. In all cases, current total deer harvest levels in the Project Area would be greater than 10 percent of estimated habitat capability. Under all alternatives, including Alternative 1, there is a significant possibility of significant restriction of subsistence use of Sitka black-tailed deer by the residents of most local communities through the foreseeable future.

Black bear and marten habitat capabilities appear to be below needed populations in some areas and close to needed populations for the Project Area as a whole under all alternatives including Alternative 1.

Issue 4—Wildlife Habitat and Biodiversity

The major effects on wildlife habitats in all action alternatives are the reduction of old-growth forest habitat (Volume Classes 4 to 7) and the increased access provided by the construction or reconstruction of roads into presently unroaded areas. Figure 2-3 shows the old-growth harvest and road construction and reconstruction under each alternative.

Alternative 12 would result in the greatest effects on old-growth habitat and effects due to increased access, while Alternative 10 would result in the least among the action alternatives. All alternatives would result in impacts consistent with the implementation of TLMP (1997).

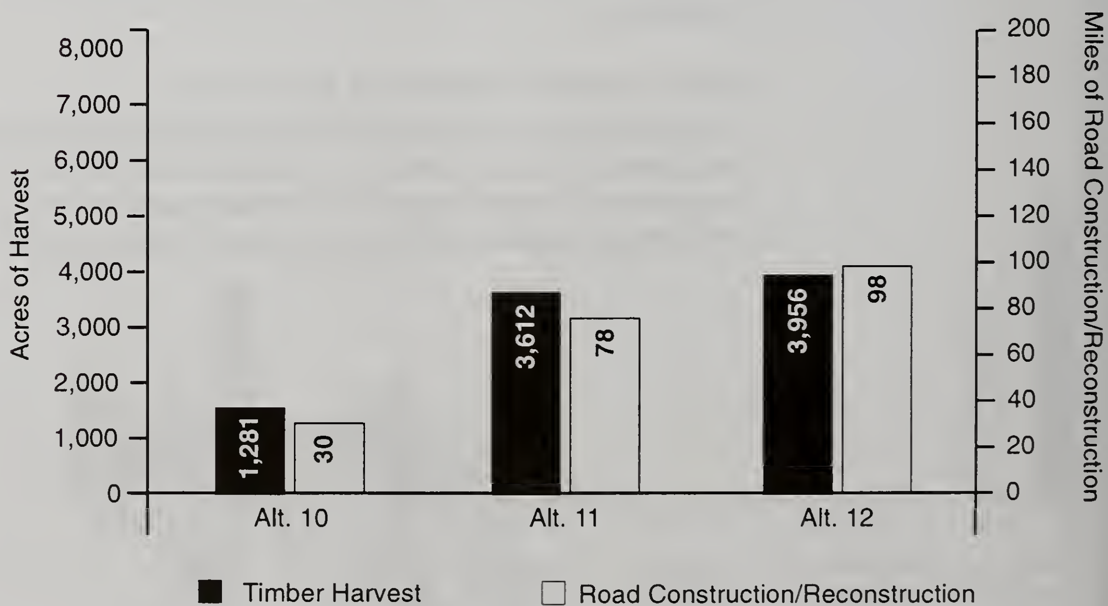
All action alternatives would reduce the frequency of large, unfragmented old-growth patches (Table 2-2). Under the action alternatives the total area of the one remaining forest patch in the Project Area greater than 10,000 acres would range from 29,056 acres after implementation of Alternative 12 to 29,739 acres after implementation of Alternative 10. These compare with the existing condition of 29,739 acres of forest patches greater than 10,000 acres. Overall, the fragmentation of large forest patches would be relatively minor with all of the alternatives.

Issue 5—Fish Habitat and Water Quality

No measurable effects on fish habitat or water quality are expected under any of the alternatives. All alternatives meet the requirement and intent of the Clean Water Act. Implementation of identified fish habitat enhancement opportunities could increase habitat for fish production. Implementation of TTRA-required stream buffers, additional-width buffers per the Revised Forest Plan Standards and Guidelines, and BMP's and other relative mitigation measures would effectively mitigate fish habitat and water quality impacts. These conclusions are supported by the fish habitat capability models for coho and pink salmon and Dolly Varden char.

Most major watersheds in the Project Area have experienced prior road construction and timber harvest. Reentering these drainages may generate a greater potential risk of impacts on water quality, with the risk expected to be greater in those watersheds with the higher cumulative harvest percentages. Based on the watershed analysis presented here, none of the alternatives are expected to produce significant watershed effects; the risk of effects would be highest under Alternative 12 and lowest under Alternative 10.

Figure 2-3
Timber Harvest and Road Construction/Reconstruction



Measures of potential risk to water quality and fish habitat are: (1) an index of the amount of soil disturbance, which is related to the area harvested, the logging systems used, and the area disturbed during road construction; (2) the amount of harvest on slopes with a high mass movement index; (3) the amount of riparian area harvested outside of no-cut buffers (primarily around lakes and along Class III/IV streams); (4) the number of Class I, II, and III/IV stream road crossings; and (5) the length of Class III stream shoreline vegetation removal due to timber harvest. These measures are quantified in Table 2-3 and displayed graphically in Figure 2-4. Review of Table 2-3 and Figure 2-4 indicates that Alternative 10 ranks lowest and Alternative 12 ranks highest in these measures of potential risk.

Potential effects on marine habitats and organisms would also be lowest under Alternative 10 and highest under Alternative 12 in proportion to timber volume that would be transported to existing LTF's.

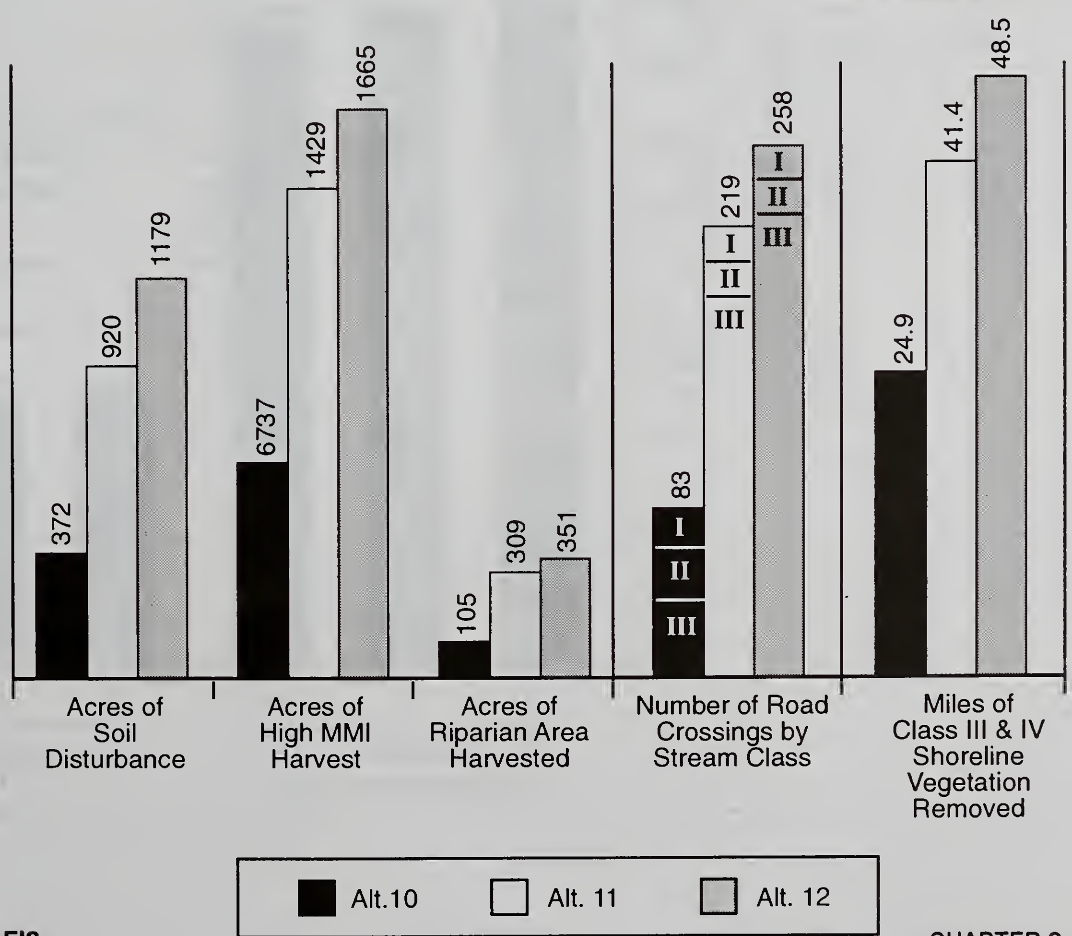
Issue 6—Timber Economics and Supply

Preliminary economic analysis indicates that overall net stumpage values would be positive for all action alternatives using early 1995 timber prices (Table 2-2). Figure 2-5 compares the stumpage values and PNV's for the action alternatives. Alternative 12 has the lowest stumpage value, and Alternative 10 has the highest (Table 2-2). Alternatives 10, 11, and 12 have similar PNV's. Alternative 12 has the highest payment to the State of Alaska followed by Alternatives 11 and 10. Alternative 12 would create the highest number of jobs followed by Alternatives 11 and 10.

Timber supply analysis indicates the distribution between geographic areas on Prince of Wales Island is expected to change from patterns of past harvest. Future harvest will shift away from

Figure 2-4

Risk to Water Quality and Fish Habitat, by Alternative



the northern and north-central road systems and towards the south-central and isolated areas. This is expected to decrease the timber harvest levels available for communities in the northern half of Prince of Wales Island that are dependent on harvest from National Forest System lands. Likewise, communities in the southern half and isolated areas of Prince of Wales Island could expect an increase in timber harvest levels in the future.

Issue 7—Karst and Cave Resources

Within the total unit pool of harvest units, three units include low-to-moderate vulnerability karst; there are no units that are rated as high vulnerability. The potential extent of affected karst within the harvest units is about 10 acres for Alternatives 11 and 12, and none for Alternative 10. The miles of road that potentially affect karst areas range from about 0.8 miles for Alternatives 11 and 12 to none for Alternative 10. Specific mitigation measures to minimize the potential for adverse effects have been prescribed for all three units.

Figure 2-5
Net Stumpage Values ($/MBF) and PNV's ($million)

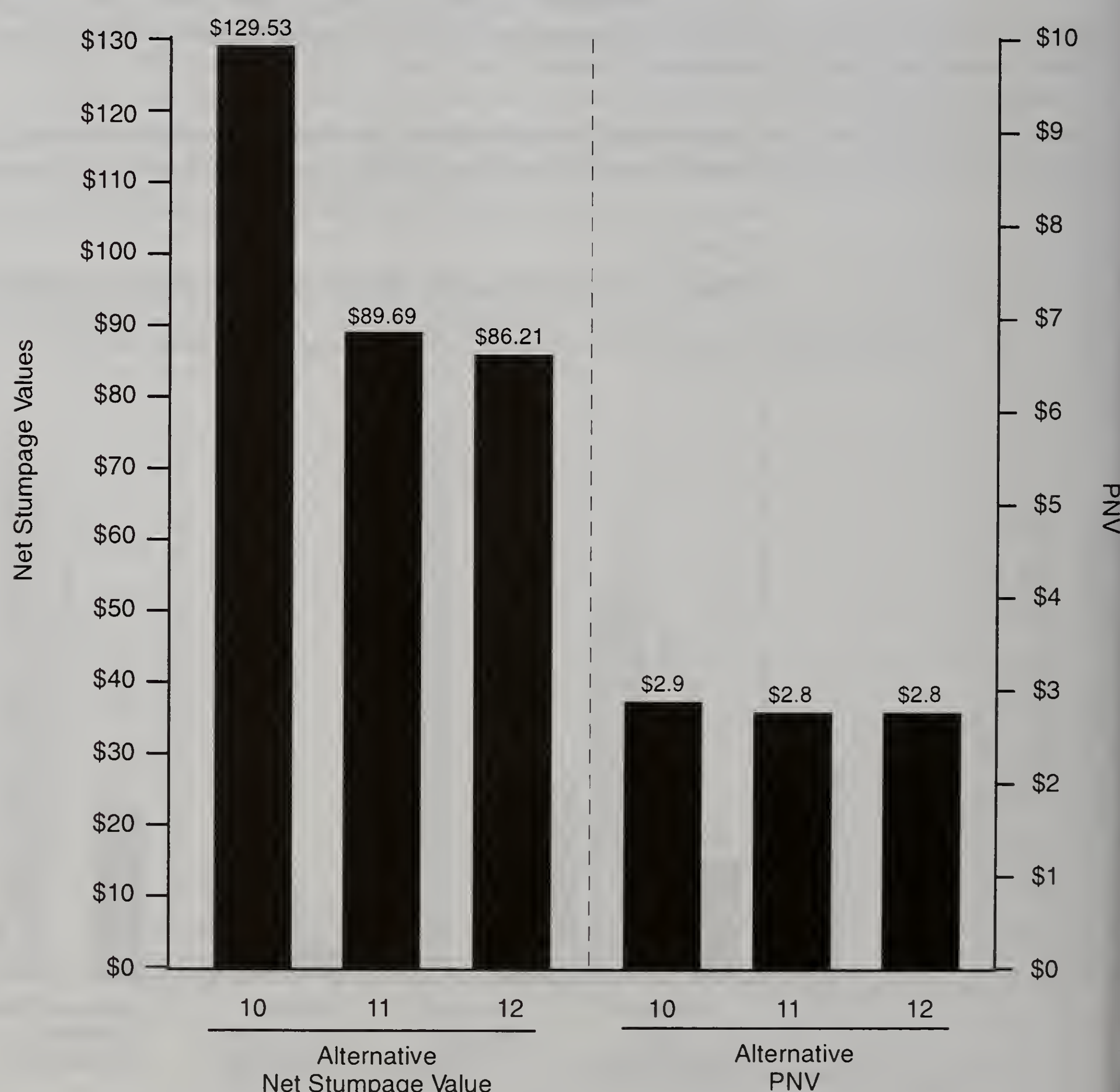


Table 2-2
Physical and Economic Outputs of Alternatives

Item	Units	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Timber					
Harvest Units	Number	0	38	98	123
Harvest Units	Acres	0	1,281	3,612	4,452
Avg. Unit Size	Acres	0	33.7	36.9	36.2
Avg. Volume per acre (in units)	MBF	0	28.3	24.7	24.2
Units over 100 acres	Number	0	1	3	4
Total Volume (including ROW)	MMBF	0	38	94	113
Silvicultural System					
Clearcut					
Type A	Acres	0	740	1,558	1,810
Type B	Acres	0	309	928	1,073
Type C	Acres	0	93	217	223
Overstory Removal	Acres	0	6	117	327
Seed Tree	Acres	0	21	23	91
Shelterwood (Type G Harvest)	Acres	0	88	327	380
Shelterwood (Type H Harvest)	Acres	0	12	28	28
Uneven-aged Management	Acres	0	13	416	520
Logging system					
Highlead Harvest	Acres	0	308	559	670
Shovel Harvest	Acres	0	81	376	445
Running Skyline Harvest	Acres	0	338	1,242	1,706
Live Skyline Harvest	Acres	0	195	530	530
Slackline Harvest	Acres	0	181	361	496
Helicopter Harvest	Acres	0	177	544	605
Roads and Facilities					
Road Construction/Reconstruction (includes all specified and temporary roads)	Miles	0	30	78	98
Road Construction/Reconstruction	Acres	0	270	702	882
New Log Transfer Facilities	Number	0	0	0	0
Potential for New Logging Camps	Number	0	0	0	0
Economics					
Estimated Net Stumpage (Current Values)	$/MBF		$129.53	$89.69	$86.21
Present Net Value	$ million		$2.9	$2.8	$2.8
Payments to State of Alaska	$ million	0	$2.2	$5.6	$6.8
Average Annual Direct Jobs Over 4 Years	# of jobs	0	54	138	168

Table 2-3
Environmental Consequences of Alternatives

Item	Units	Alternative 1	10	11	12
Caves and Significant Karst Features					
Harvest Units Potentially Affecting	# of Units	0	0	0	0
Soils					
Area of Soil Disturbance					
Harvest Units	Acres	0	101	215	274
Roads and Landings	Acres	0	271	705	905
Total Area Affected by Mass Movement Index Category					
Very High MMI	Acres	0	0	0	0
High MMI	Acres	0	637	1,429	1,655
Wetlands, Floodplains, & Riparian					
Wetland Area Affected					
Harvest Units	Acres	0	715	1,785	2,268
Roads	Acres	0	170	394	533
Class I Stream Floodplain					
Road Crossings	Number	0	10	29	39
Riparian Management Area					
Harvested	Acres	0	105	309	351
Fish and Water Quality					
Road Crossings					
Class I Streams	Number	0	10	29	39
Class II Streams	Number	0	19	37	43
Class III/IV Streams	Number	0	54	153	176
Streamside Vegetation Clearing					
Harvest Units (Class III Streams)	Miles	0	25	41	48
Wildlife					
Change in MIS Habitat Capability					
Sitka Black-tailed Deer	Percent	0	-1	-3	-4
Black Bear	Percent	0	-1	-6	-6
Marten	Percent	0	-1	-4	-4
Gray Wolf	Percent	0	-1	-3	-3
River Otter	Percent	0	0	0	0
Vancouver Canada Geese	Percent	0	-1	-1	-2
Bald Eagle	Percent	0	0	0	0
Red-breasted Sapsucker	Percent	0	-1	-4	-5
Hairy Woodpecker	Percent	0	-1	-6	-7
Brown Creeper	Percent	0	-1	-3	-3
Harvest in Deer Winter Range					
High Quality Winter Range	# of Units	0	2	18	23

Table 2-3 (continued)
Environmental Consequences of Alternatives

Item	Units	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Biodiversity					
Unfragmented Old-growth Patches Remaining					
>10,000 acres	Acres	29,739	29,739	29,342	20,056
5,000-10,000 acres	Acres	6,598	6,405	5,948	5,948
1,000-5,000 acres	Acres	24,785	22,409	20,402	20,135
Subsistence					
Deer Habitat Capability	Number	9,718	9,678	9,542	9,523
1995 Harvest as a % of Habitat Capability	Percent	11.2	11.3	11.4	11.5
Harvest Area Used by >15% of Rural Community Households for Deer Hunting	Acres	0	222	226	291
Visual and Recreation Resources					
Priority Travel Routes and Use Areas					
West Coast Waterway	# of Units Visible	0	1	7	9
Waters Around Craig and Klawock	# of Units Visible	0	1	5	5
Control Lake Cabin	# of Units Visible	0	1	1	1
Eagle's Nest Campground	# of Units Visible	0	0	0	0
Thorne River/Honker Divide Canoe Route	# of Units Visible	0	0	0	0
Forest Highway #9	# of Units Visible	0	8	10	12
ROS Settings					
Change in Area of Unroaded Settings	Acres	0	-7,124	-27,506	-36,119
Change in ROS at Existing Recreation Sites	# of sites	0	0	0	0
Change in ROS at Potential Recreation Sites	# of sites	0	2	2	2
Cultural Resources					
Sites Affected					
Direct Effects	# of sites	0	0	0	0
Risk of Indirect Effects	# of sites	0	0	0	0

Table 2-4
Landscape Zone Effects

1. HONKER WATERSHED

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed; watershed functions, water quality, fisheries habitat maintained.	733 acres harvested within the watershed and 14 miles of road of constructed. Watershed functions, water quality, fisheries habitat maintained by unit and road design and BMP implementation.	1,731 acres harvested within the watershed and 27 miles of road constructed. Watershed functions, water quality, fisheries habitat maintained by unit and road design and BMP implementation.	2,169 acres harvested within the watershed and 38 miles of road constructed. Watershed functions, water quality, fisheries habitat maintained by unit and road design and BMP implementation.

2. HONKER BLOCK

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a medium old-growth block maintained.	60 acres harvested and 1 mile of road constructed. Ability to function as a large old-growth block maintained.	140 acres harvested and 2 miles of road constructed. Ability to function as a large old-growth block maintained.	253 acres harvested and 5 miles of road constructed. Ability to function as a large old-growth block maintained.

3. HONKER SCENIC CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Recreational and visual, and resources maintained at present levels.	No units harvested or roads constructed. Recreational and visual resources maintained at present levels.	No units harvested or roads constructed. Recreational and visual resources maintained at present levels.	No units harvested or roads constructed. Recreational and visual resources slightly affected.

4. BAIRD PEAK LATE-SUCCESSIONAL CORRIDOR WATERSHED

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	130 acres of harvest and 2 miles of road constructed. Ability to function as a corridor reduced.

5. GOSHAWK POST-FLEGDING AREA LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	48 acres harvested and 1 mile of road constructed. Ability to function as a corridor maintained.

Table 2-4 (continued)
Landscape Zone Effects

6. GOSHAWK POST-FLEDGLING AREA			
Alternative 1	**Alternative 10**	**Alternative 11**	**Alternative 12**
No units harvested or roads constructed. Ability to function as post-fledging area and small old-growth block maintained.	No units harvested or roads constructed. Ability to function as a post-fledging area and small old-growth block maintained.	118 acres harvested and 3 miles of road constructed; within guideline limits. Ability to function as a post-fledging area and small old-growth block slightly reduced.	118 acres harvested and 3 miles of road constructed; within guideline limits. Ability to function as a post-fledging area and small old-growth block slightly reduced.

7. UPPER CUTTHROAT LAKES			
Alternative 1	**Alternative 10**	**Alternative 11**	**Alternative 12**
No units harvested or roads constructed. Recreational, visual, wildlife, and aquatic resources maintained at present levels.	No units harvested or roads constructed. Recreational, visual, wildlife, and aquatic resources maintained at present levels.	No units harvested or roads constructed. Recreational, visual, wildlife, and aquatic resources maintained at present levels.	No units harvested or roads constructed. Recreational, visual, wildlife, and aquatic resources maintained at present levels.

8. DRUMLIN FIELD			
Alternative 1	**Alternative 10**	**Alternative 11**	**Alternative 12**
No units harvested or roads constructed. Ability to provide old-growth habitat, winter range, and wetland habitat completely maintained.	104 acres harvested and 3 miles of road constructed. Ability to provide old-growth habitat and winter range slightly reduced. Wetland values and functions maintained through BMPs.	65 acres harvested and 2 miles of road constructed. Ability to provide old-growth habitat and winter range slightly reduced. Wetland values and functions maintained through BMPs.	178 acres harvested and 5 miles of road constructed. Ability to provide old-growth habitat and winter range slightly reduced. Wetland values and functions maintained through BMPs.

9. 30 ROAD CORRIDOR			
Alternative 1	**Alternative 10**	**Alternative 11**	**Alternative 12**
No units harvested. Visual disturbance is unchanged.	100 acres harvested and 3 miles of road constructed. Visual disturbance remains low.	65 acres harvested and 2 miles of road constructed. Visual disturbance remains low.	147 acres harvested and 4 miles of road constructed. Visual disturbance changes from low to moderate.

Table 2-4 (continued)
Landscape Zone Effects

10. RIO ROBERTS WATERSHED

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Watershed functions, water quality, fisheries habitat maintained. Ability to function as an undesignated control watershed completely maintained.	26 acres harvested and 1.5 miles of road constructed. Watershed functions, water quality, fisheries habitat maintained. Ability to function as unofficial control watershed maintained.	169 acres harvested and 4 miles of road constructed. Watershed functions, water quality, fisheries habitat maintained. Ability to function as unofficial control watershed maintained.	178 acres harvested and 4 miles of road constructed. Watershed functions, water quality, fisheries habitat maintained. Ability to function as unofficial control watershed maintained.

11. RIO ROBERTS LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested and 1 mile of road constructed. Ability to function as a corridor maintained.	No units harvested and 1 mile of road constructed. Ability to function as a corridor maintained.

12. RIO ROBERTS RESEARCH NATURAL AREA

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as an RNA maintained.	No units harvested or roads constructed. Ability to function as an RNA maintained.	No units harvested or roads constructed. Ability to function as an RNA maintained.	No units harvested or roads constructed. Ability to function as an RNA maintained.

13. ANGEL LAKE LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	140 acres harvested and 4 miles of road constructed. Ability to function as a corridor slightly reduced.	140 acres harvested and 4 miles of road constructed. Ability to function as a corridor slightly reduced.

14. BALLS LAKE LATE SUCCESSONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	258 acres harvested and 2 miles of road constructed. Ability to function as a corridor slightly reduced.	258 acres harvested and 2 miles of road constructed. Ability to function as a corridor slightly reduced.

15. KOGISH MOIUNTAIN LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as corridor and a small old-growth block maintained.	No units harvested or roads constructed. Ability to function as a corridor and a small old-growth block maintained.	488 acres harvested and 6 miles of road constructed. Ability to function as a corridor slightly reduced. Ability to function as a small old-growth block maintained.	488 acres harvested and 6 miles of road constructed. Ability to function as a corridor slightly reduced. Ability to function as a small old-growth block maintained.

Table 2-4 (continued)
Landscape Zone Effects

16. WESTERN PENINSULA

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to provide old-growth habitat, and provide for subsistence resources is maintained.	No units harvested or roads constructed. Ability to provide old-growth habitat and provide for subsistence resources is maintained.	290 units harvested and 12 miles of roads constructed. Ability to provide old-growth habitat, and provide for subsistence resources is slightly reduced.	577 acres harvested and 16 miles of road constructed. Ability to provide old-growth habitat and provide for subsistence resources is moderately reduced.

17. ELEVENMILE LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained.	No units harvested or roads constructed. Ability to function as a corridor maintained.	69 acres harvested and 3 miles of road constructed. Ability to function as a corridor slightly reduced.	93 acres harvested and 3 miles of road constructed. Ability to function as a corridor slightly reduced.

18. ELEVENMILE BLOCK

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance.	No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance.	101 acres harvested and 1.5 miles of roads constructed. Ability to function as a small old-growth block slightly reduced. Visual disturbance changes from none to low.	364 acres harvested and 6 miles of road constructed. Ability to function as a small old-growth block moderately reduced. Visual disturbance changes from none to low.

19. WESTERN SHORELINE LATE-SUCCESSIONAL CORRIDOR

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a corridor maintained. No change in visual disturbance. No effect to cultural resources.	No units harvested or roads constructed. Ability to function as a corridor maintained. No change in visual disturbance. No effect on cultural resources.	No units harvested or roads constructed. Ability to function as a corridor maintained. No change in visual disturbance. No effect on cultural resources.	No units harvested or roads constructed. Ability to function as a corridor maintained. No change in visual disturbance. No effect on cultural resources.

20. SALT LAKE BAY BLOCK

Alternative 1	Alternative 10	Alternative 11	Alternative 12
No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance. No effect to cultural resources.	No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance. No effect to cultural resources.	No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance. No effect to cultural resources.	No units harvested or roads constructed. Ability to function as a small old-growth block completely maintained. No change in visual disturbance. No effect to cultural resources.

Mitigation Measures

The 1997 Forest Plan Revision presents management prescriptions for each land use designation and Forest-wide standards and guidelines which are to be followed in the development of mitigation measures. Likewise, the plans provide forest management goals and objectives but do not contain project decisions. The analysis supporting this EIS discloses possible adverse impacts that are specific to the locality and to the actions proposed. Therefore, measures were formulated to mitigate these impacts guided by forest management goals and objectives, under the overall direction given by the proposed land use designation management prescriptions, and following the proposed Forest-wide standards and guidelines.

Most of these measures are harvest unit- or road-specific, but many of these measures result in the complete elimination or deferral of harvest from geographic areas. These broad measures are identified and discussed first, followed by a summary of the site-specific measures. Mitigation measures are described in more detail in the appropriate sections of Chapter 4. Unit-specific mitigation measures are summarized by harvest unit in Appendix C. These are described in greater detail on the unit design cards in Appendix F of the Draft EIS.

Site-Specific Mitigation Measures

A wide variety of site-specific mitigation measures designed primarily to avoid or minimize adverse impacts, have been evaluated and incorporated into harvest unit and road design, preliminary layout, and would be incorporated into final layout and timber sale implementation. These measures are summarized in Table 2-5 along with the number of harvest units affected for each alternative. A specific listing of each unit affected by each measure is provided in Appendix C. A description of the mitigation measures for each unit and road segment is provided in the unit and road design cards in Appendices F and G of the Draft EIS.

In addition to the site-specific measures listed in these tables, a variety of other site-specific measures would apply to all harvest and construction activities and would be incorporated into timber harvest unit and road design. These measures include all appropriate BMP's not specifically identified in the table. Direction for use of BMP's on National Forest System lands in Alaska is included in Chapter 10 of the Region 10 Soil and Water Conservation Handbook (FSH 2509.22) (USDA Forest Service, 1991b). The handbook describes the application, monitoring, evaluation, and refinement of these BMP's. Appendix C of the Revised Forest Plan (TLMP, 1997) provides a listing and brief summary of the BMP's used in the Alaska Region. Many other Forest Plan standards and guidelines apply, in addition to those cited in Table 2-5. These standards and guidelines are incorporated by reference (TLMP, 1997).

Monitoring

Monitoring activities can be divided into three broad categories: Forest Plan monitoring, routine implementation monitoring, and project-specific monitoring. These broad types are discussed in the following sections.

Forest Plan

The National Forest Management Act requires that National Forests monitor and evaluate their forest plans (36 CFR 219.11). The significance of this requirement is emphasized by the recent development of a National Monitoring and Evaluation Strategy (USDA Forest Service, 1993a). The Strategy is designed to focus agency attention and resources on evaluating implementation of forest plans to provide the Forest Service with information necessary to ensure responsive and efficient management of National Forests. Embodied in the National Monitoring and Evaluation Strategy are three principles: (1) evaluation of results will be readily available to the

Table 2-5
Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] 10	11	12
Minerals and Caves				
M1	Protect all known mineral improvements, such as mine claim markers, by specifications in timber sale and road construction contracts.	0	0	0
M2	Develop and implement site-specific protective measures for cave and karst features containing significant resources.	0	1	1
Fish, Water Quality, and Soils				
F1	Modify unit design to avoid very high mass movement areas (BMP 13.5), and areas dominated by McGilvery soils.	5	18	23
F2	Avoid road construction in areas of very high mass movement potential resulting in the need for helicopter yarding.	1	5	5
F3	Require partial- to full-suspension logging systems in areas with high mass movement potential or McGilvery soils (BMP 13.9).	9	29	29
F4	Modify unit design or logging system to avoid or minimize damage to muskegs or other wetlands (BMP's 12.5 and 13.15).	1	6	10
F5	Establish no-harvest and selective-cut buffers along streams and around lakes to protect riparian management areas (BMP 12.6). This includes TTRA minimums and additional area as described in the Stream and Lake Protection Management Prescription.	24	61	76
F6	Require split-yarding and directional felling along selected Class III streams with no buffers to provide for streambank and stream channel protection (BMP 12.7 and 13.16).	24	65	78
F7	Permit no harvest within steep V-notch streams with high erosion potential (BMP 13.16).	3	7	8
F8	Implement measures to reduce surface erosion and drainage interruption related to transportation including water barring and cross-draining roads, using ditches and culverts to prevent water running long distances over roads, seeding and fertilizing cut and fill slopes, and locating and designing landings for good drainage and dispersion of water (BMP's 13.10 14.3, 14.5, 14.8, 14.9, 14.11, 14.12, 14.13).	31	77	99
F9	Protect local water supplies by implementing erosion control measures during road construction.	0	0	0
F10	Establish timing restrictions for instream road construction activities to avoid impacts on fish populations (BMP 14.6).	14	35	47

Table 2-5 (continued)

Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] 10	11	12
F11	Evaluate opportunity for stream barrier removal to increase fish habitat availability.	-	-	-
F12	Evaluate opportunity for stream habitat enhancement by addition of large woody debris (LWD).	-	-	-
Vegetation and Timber				
T1	Conduct partial harvest by helicopter to maintain yellow-cedar trees in the unit to provide seed and shelter to maintain high yellowcedar composition in future stand.	0	0	1
Wildlife				
W1	Provide for greater habitat diversity on a stand level by leaving no-cut islands or fingers of timber (Type D Clearcut).	1	7	11
W2	Provide for greater structural diversity on a stand level by partial cutting all or most of the harvest unit.	8	31	46
W3	Provide for greater structural diversity on a stand level by leaving nonmerchantable trees and safe snags over the entire harvest unit (Type C Clearcut).	3	7	8
W4	Provide for snag retention and greater structural diversity on a stand level by prescribing and contractually requiring a specified number of reserve trees including snags and live tree replacements along the harvest unit edges and internal setting boundaries. Also leave safe-snags and nonmerchantable, reserve trees along harvest unit edges and internal setting boundaries through contractual recommendations (Type B Clearcut).	13	30	36
W5	Provide for snag retention and greater structural diversity on a stand level by leaving safe snag and nonmerchantable reserve trees along harvest unit edges and internal setting boundaries through contractual recommendations (Type A Clearcut).	18	47	55
W6	Lengthen the productive stage of young growth forests as wildlife habitat and increase structural diversity of young growth forests on a stand level by conducting variable tree spacing precommercial thinning on an experimental basis.	-	-	-
W7	Modify unit design to provide 30-acre no-cut buffers around known marbled murrelet nest sites.	0	0	0
W8	Restrict the timing of helicopter logging and/or helicopter flight paths and blasting near bald eagle nest sites when occupied.	0	1	1
W9	Implement Region 10 goshawk management guidelines, as appropriate, if nesting is identified.	-	-	-
W10	Implement road closures immediately after harvest to minimize human disturbance to wildlife and road access by hunters in specific areas.	-	-	-

Table 2-5 (continued)

Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] 10	11	12
W11	Evaluate potential for disturbance and restrict harvest and road construction activities in areas and during time periods when Vancouver Canada goose nesting or trumpeter swan wintering might be disturbed.	6	9	10
W12	Restrict harvest and road construction during wolf mating, denning, and rearing periods within one-half mile of dens.	0	0	0
W13	Restrict the approach of Forest Service-authorized aircraft and vessels near humpback and other whales.	-	-	-
W14	Restrict harvest and road construction within 1/2 mile of active peregrine falcon nest sites.	1	1	
Visual Resources				
V1	Modify unit boundaries to allow harvest unit to meet proposed VQO's in partial retention/retention areas.	0	2	3
V2	Conduct partial cutting of unit to minimize visual contrast with adjacent areas.	0	5	5
V3	Leave behind all nonmerchantable trees after clear-cutting to minimize visual contrast with adjacent areas.	0	0	0
Recreation				
R1	Close roads to keep area as remote as possible to minimize effects on roadless opportunities.	-	-	-
R2	Provide for public access, parking, and sufficient turn-outs at recreation sites.	-	-	-
R3	Require all road construction slash and debris from right-of-way (ROW) clearing along roads to be used for recreational access, to be buried in the road prism or hauled to a designated disposal area.	-	-	-
Cultural Resources				
C1	Provide for mitigation of indirect effects to cultural resource sites near proposed harvest units and roads.	-	-	-

- These measures potentially affect an indefinite number of harvest units.

1/ Refer to the appropriate section in Chapter 4 for a more complete description of each measure.

2/ Refer to Appendix C for a specific listing of the units affected.

public, agencies, and other groups; (2) monitoring and evaluation will focus on ecosystems and emphasize interrelationships among biotic and abiotic components; and (3) the strategy will be flexible to meet local needs while encompassing forest, regional, and national requirements. Three levels of monitoring are incorporated into Forest Plan monitoring and evaluation:

- **Implementation Monitoring** is used to determine if goals, objectives, standards and guidelines, and management prescriptions are implemented as detailed in the Forest Plan and project specifications.
- **Effectiveness Monitoring** is used to determine if standards and guidelines and management prescriptions as designed and implemented are effective in meeting Forest Plan goals and objectives.
- **Validation Monitoring** is used to determine whether the data, assumptions, and coefficients used in the development of the Plan are correct.

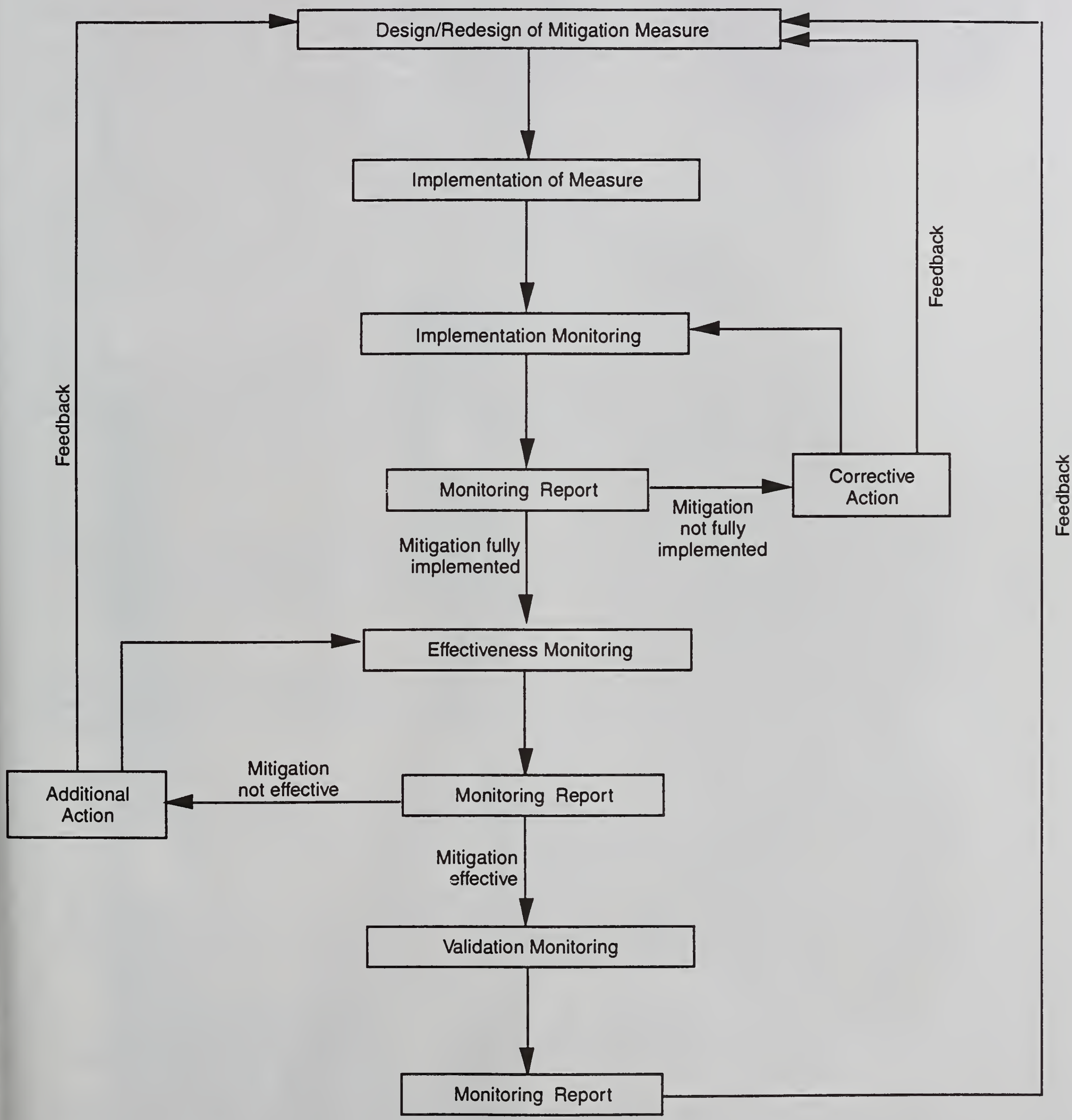
Most monitoring elements involve the mitigation measures described previously. The mitigation measures are part of a process that includes these three types of monitoring to determine if the measure was implemented and is effective or needs revision. The feedback provided by monitoring results can be used to develop improved methods or additional treatments to ensure that the mitigation will be effective in the future. Figure 2-6 displays how this process of mitigation and monitoring occurs.

An annual monitoring report is being prepared by each Administrative Area of the Tongass and incorporated into one Tongass report at the end of each year beginning with Fiscal Year 1993.

The Ketchikan Area submitted its 1993 Plan to the Regional Forester in December 1993. In early 1994, the Ketchikan Area adopted a Monitoring Strategy to more specifically guide area monitoring effects. Results of this more intensive coordinated effort are included in the annual Fiscal Year Monitoring and Evaluation Reports. These reports address all monitoring questions contained in the applicable Forest Plan, reference all monitoring being conducted on the area/forest, assess progress towards achieving the goals and objectives described in the Forest Plan, and either certify that the Forest Plan is sufficient to guide management of the forest over the next year or propose needed changes and an approach for dealing with those changes.

Forest Plan monitoring is conducted over the entire forest on a sample basis. Samples may or may not be taken within the Control Lake Project Area; however, monitoring results are

Figure 2-6
Mitigation/Monitoring Feedback Loop



designed to answer questions regarding the implementation and effectiveness of mitigation within the Project Area. A number of implementation, effectiveness, and validation monitoring items are identified for each resource area in the forest-wide monitoring plan described in the TLMP Revision (1997).

Routine Implementation Monitoring

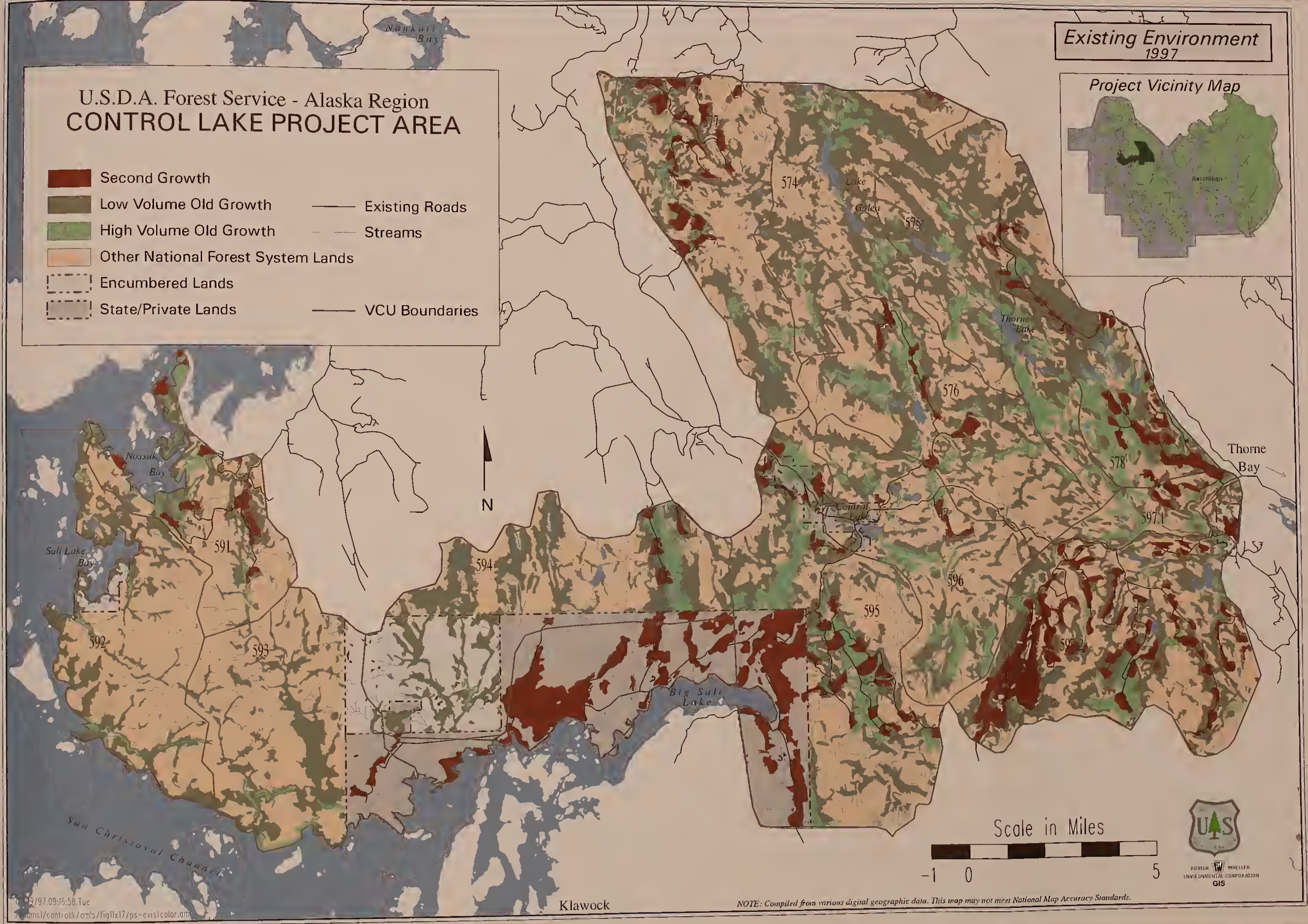
Routine implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for routine implementation monitoring began with the preliminary design of harvest units and roads. Specialists used on-the-ground inventories, computer inventories, and aerial photographs to prepare documents called unit cards for each harvest unit in each of the alternatives. Cards were also prepared for each segment of road. Resource specialists wrote their concerns on the cards and then described how the concerns could be addressed in the design of each unit and road segment. Integrated silvicultural prescriptions were prepared to describe the detailed interdisciplinary prescription for each unit. Resource concerns, mitigation measures, and prescriptions will be refined further during final layout when specialists will have one more opportunity to revise the unit and road card recommendations and integrated silvicultural prescriptions. The unit and road cards and prescriptions will be the basis for determining whether recommendations were implemented for various aspects of the Control Lake Project.

Routine implementation monitoring is part of the administration of a timber sale contract. The sale administrators and road inspectors ensure that the recommendations contained on the unit and road cards and the prescriptions are incorporated into contract documents and then monitor performance relative to contract requirements. All units and roads in the timber sale are included in the monitoring.

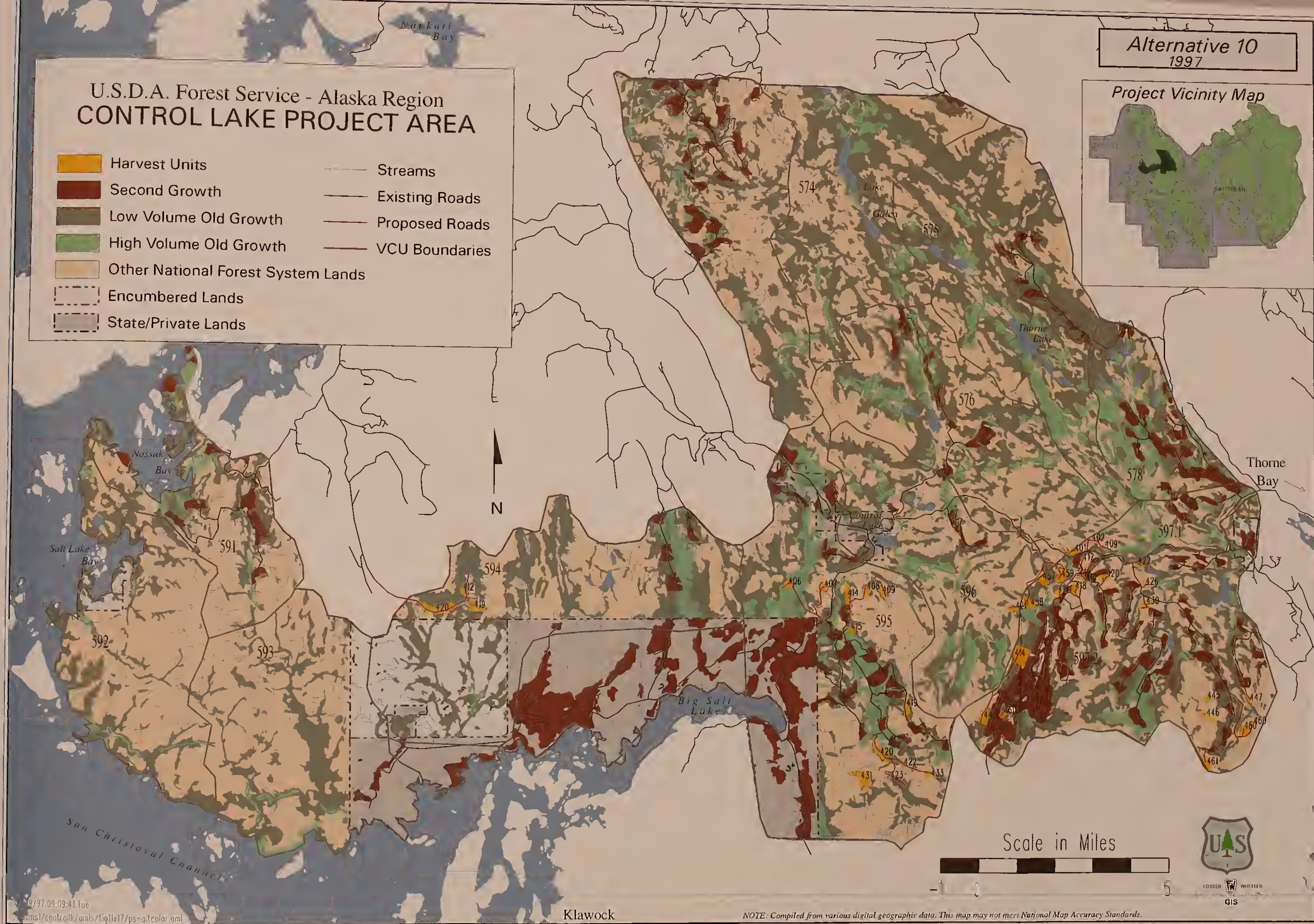
Project-specific Monitoring

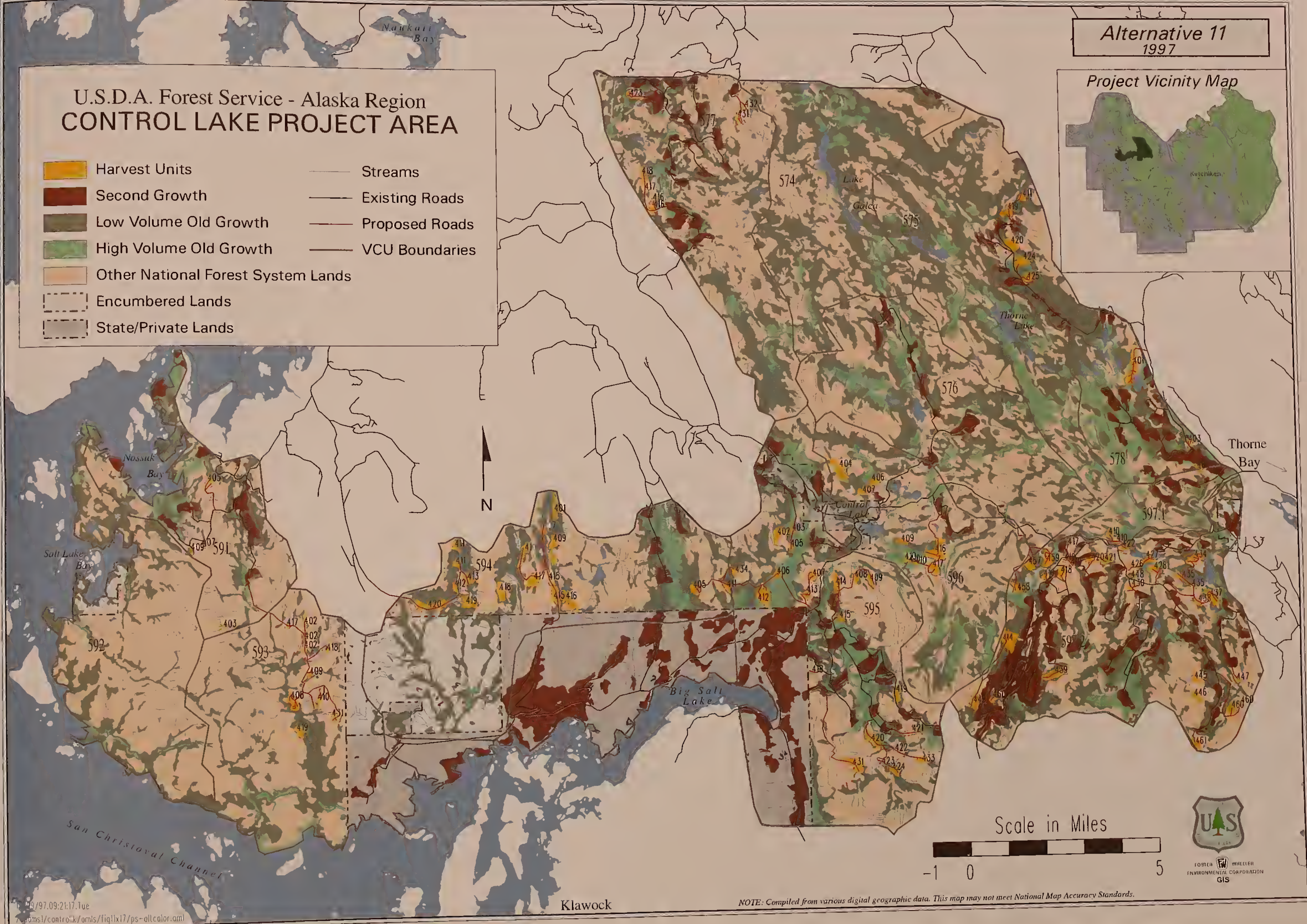
In addition to the Forest Plan monitoring and routine implementation monitoring that will be conducted throughout the Tongass National Forest, including the Control Lake Project Area, project-specific monitoring activities are identified. The following provides a description for each project-specific monitoring activity.

- Ecosystem Management Objective: To determine if the four types of clearcuts, with reserve trees, and the five types of partial cuts, prescribed in this project for ecosystem management, have been implemented, provide structural diversity after harvesting, and verify the extent of reserve tree blowdown.
- Desired Result: All four types of clearcuts and five types of partial cuts have been implemented and each type provides structural diversity, to varying degrees, maintains snag densities and structure in the second-growth stand, and reduces the visual contrast between the clearcut and adjacent old growth, for at least 10 years post-harvest.
- Measurement: Compare unit cards and silvicultural prescriptions with observations on the ground on 20 percent of the units for each harvest type. Prepare narrative description and map of reserve tree size, density, and distribution and include an assessment of the extent of blowdown and the VQO achieved. Examine the effect of site factors on the degree of blowdown.
- Evaluation: Modify future unit prescriptions based on feedback obtained.
- Responsible Staff: Thorne Bay Ranger District wildlife staff, silviculturist, and landscape architect
- Record of Results: Prepare a brief report of results, 1, 5, and 10 years after harvest. Annual Cost: $9,000.
- Personnel Needs: 0.3 FTE

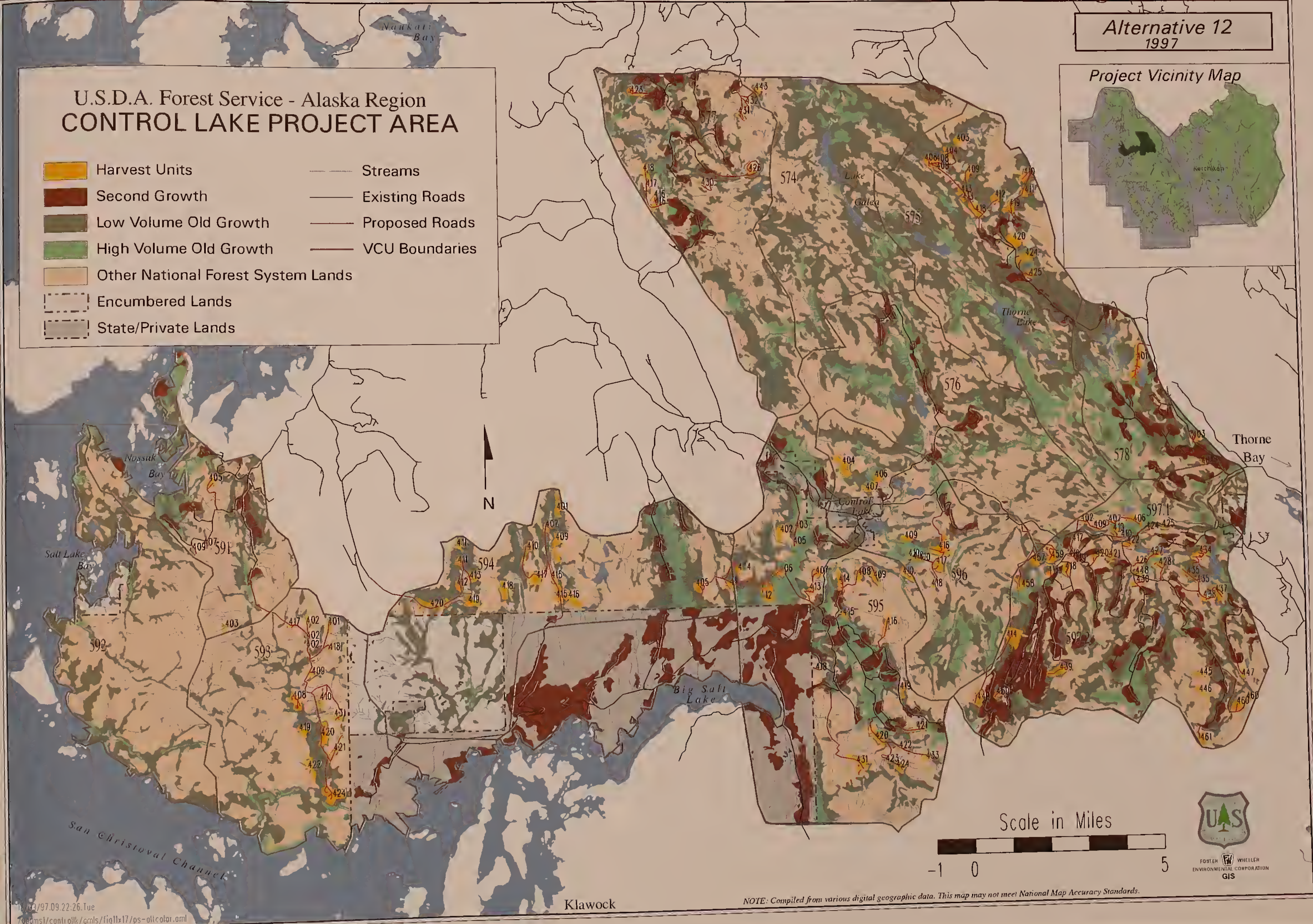


Existing Environment
1997
Project Vicinity Map
Ketchikan
U.S.D.A. Forest Service - Alaska Region
CONTROL LAKE PROJECT AREA
Second Growth
Low Volume Old Growth
High Volume Old Growth
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads
Streams
VCU Boundaries
N
Naukati Bay
Nossuk Bay
Sulı Lake Bay
Lake Galea
Thorne Lake
Control Lake
Big Salt Lake
Thorne Bay
San Christoval Channel
Klawock
574
575
576
578
591
592
593
594
595
596
597.1
597.2
Scale in Miles
-1 0 5
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS
NOTE: Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.

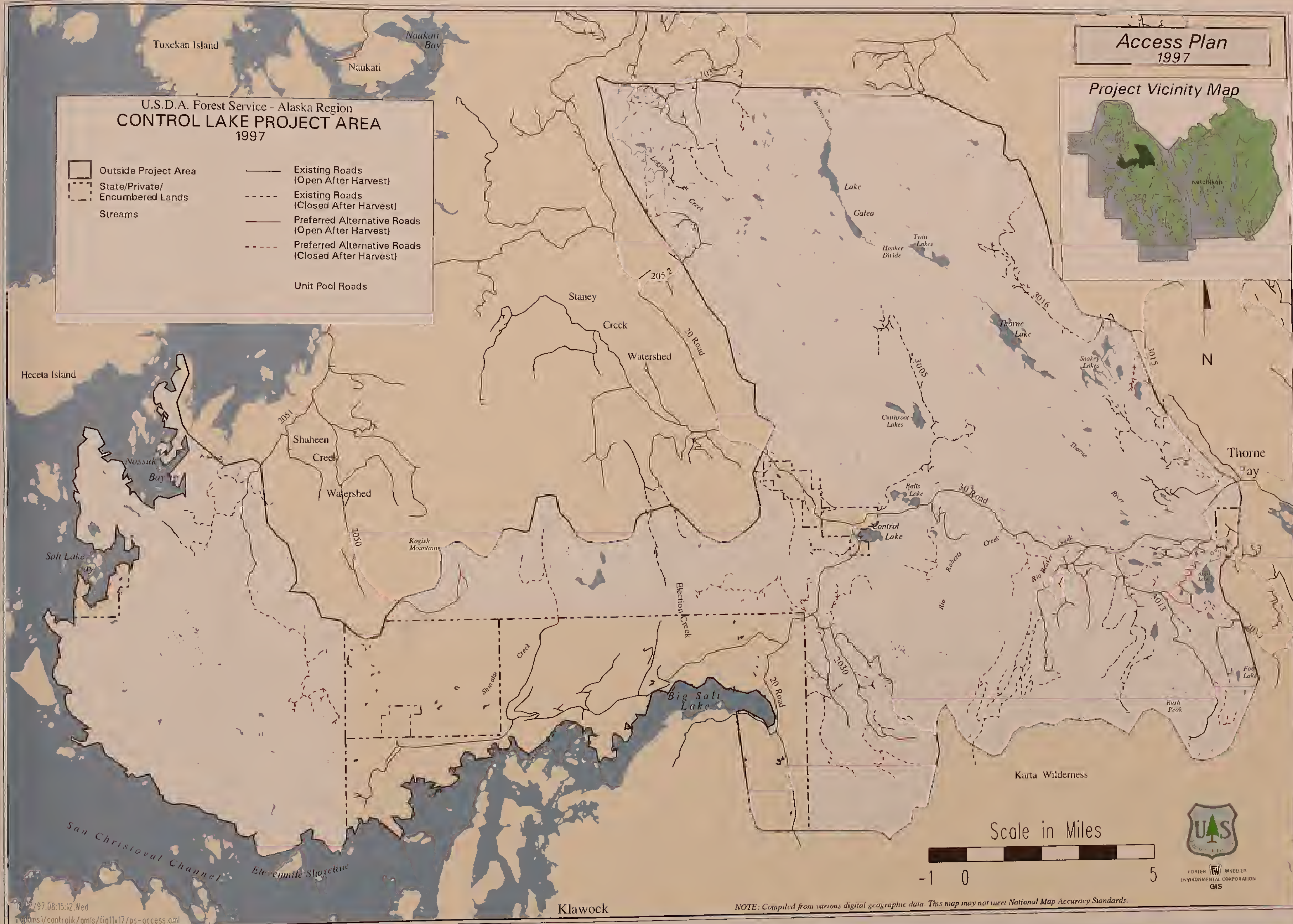

Alternative 10
1997
U.S.D.A. Forest Service - Alaska Region
CONTROL LAKE PROJECT AREA
Harvest Units
Second Growth
Low Volume Old Growth
High Volume Old Growth
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Streams
Existing Roads
Proposed Roads
VCU Boundaries
Project Vicinity Map
Thorne Bay
Control Lake
Big Salt Lake
Salt Lake Bay
San Christoval Channel
Klawock
N
Scale in Miles
574
575
576
578
591
592
593
594
595
596
Thorne Lake
NOTE: Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.



Alternative 11
1997
U.S.D.A. Forest Service - Alaska Region
CONTROL LAKE PROJECT AREA
Harvest Units
Second Growth
Low Volume Old Growth
High Volume Old Growth
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Streams
Existing Roads
Proposed Roads
VCU Boundaries
Project Vicinity Map
N
Naukati Bay
Nossuk Bay
Salt Lake Bay
Lake Galea
Thorne Lake
Control Lake
Big Salt Lake
Thorne Bay
San Christoval Channel
Klawock
574
575
576
577
578
591
592
593
594
595
596
597.1
Scale in Miles
-1 0 5
NOTE: Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS



Alternative 12
1997
Project Vicinity Map
Ketchikan
U.S.D.A. Forest Service - Alaska Region
CONTROL LAKE PROJECT AREA
Harvest Units
Second Growth
Low Volume Old Growth
High Volume Old Growth
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Streams
Existing Roads
Proposed Roads
VCU Boundaries
Naukati Bay
Nossuk Bay
Salt Lake Bay
Lake Galea
Thorne Lake
Control Lake
Big Salt Lake
Thorne Bay
San Christoval Channel
Klawock
N
574
575
576
577
578
591
592
593
594
595
596
597.1
Scale in Miles
-1 0 5
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS
NOTE: Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.


Access Plan
1997
Project Vicinity Map
Ketchikan
U.S.D.A. Forest Service - Alaska Region
CONTROL LAKE PROJECT AREA
1997
Outside Project Area
State/Private/
Encumbered Lands
Streams
Existing Roads
(Open After Harvest)
Existing Roads
(Closed After Harvest)
Preferred Alternative Roads
(Open After Harvest)
Preferred Alternative Roads
(Closed After Harvest)
Unit Pool Roads
Tuxekan Island
Naukati
Naukati Bay
Heceta Island
Nossuk Bay
Salt Lake Bay
Shaheen Creek Watershed
Staney Creek Watershed
Kogish Mountain
Lake Galea
Twin Lakes
Honker Divide
Thorne Lake
Snakey Lakes
Cutthroat Lakes
Balls Lake
Control Lake
Thorne River
Thorne Bay
Election Creek
Big Salt Lake
Rush Peak
Karta Wilderness
San Christoval Channel
Elevenmile Shoreline
Klawock
20 Road
30 Road
2051
2050
2052
3005
3016
3015
3013
2030
N
Scale in Miles
-1 0 5
NOTE: Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards.
FOSTER WHEELER ENVIRONMENTAL CORPORATION
GIS
12/?/97.08:15:12.Wed
/controllk/amls/fig11x17/ps-access.aml

Chapter 3

Affected Environment

Chapter 3

Affected Environment

Introduction

This chapter provides information concerning the existing environment of the Control Lake Project Area that might be affected by implementation of the action alternatives. It describes the baseline conditions against which environmental effects can be evaluated and from which progress toward the desired future condition of the resource, trends related to its status, and relevant characteristics that might be affected by the alternatives. The following resources are discussed:

Climate and Air Quality
Geology, Minerals, and Karst
Soils
Wetlands, Floodplains, and Riparian Areas
Water, Fish, and Fisheries
Vegetation and Timber Resources
Wildlife
Threatened, Endangered, and Sensitive Species
Biodiversity
Lands
Transportation and Facilities
Economic and Social Environment
Subsistence
Cultural Resources
Visual Resources
Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Area

Chapter 4 discusses the effects of the proposed alternatives on the above resources and in this same sequence.

Available Information

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area is a complex and developing science. The biology of wildlife species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, and communities is the subject matter of an inexact science.

3 Affected Environment

In developing Chapters 3 and 4 of this EIS, the interdisciplinary team (ID Team) examined the data and relationships used to estimate the effects of the alternatives. The data and level of analysis used were commensurate with the importance of the possible impacts (40 CFR 1502.15); and relevant discussion in the Revised TLMP (1997) are incorporated by reference (40 CFR 1502.21).

When encountering a gap in information, the ID Team concluded that the missing information frequently would have added precision to estimates or better specified a relationship. However, the basic data and central relationships are sufficiently well established in the respective sciences that the new information would be very unlikely to reverse or nullify understood relationships. Thus, new information would be welcomed and would add precision, but it was not essential to provide adequate information for each alternative such that the decision-maker can make a reasoned choice.

Land Divisions

The area of the Tongass National Forest has been divided in several ways to describe the different resources and allow analysis of how they might be affected by Forest Plan and project-level decisions. These divisions vary by resource since the relationship of each resource to geographic conditions and zones also varies. Three land divisions that are used for more than one resource are described in the following sections.

Geographic Provinces

These are seven large land areas that are distinguished by differences in ecological processes. They are defined by a combination of climatic and geographic features and vegetation. Geographic provinces are used in the *Biodiversity* and *Wildlife* sections.

Value Comparison Units

VCUs are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow watershed divides. The Tongass contains 867 VCUs. Thirteen VCUs are found in the Control Lake Project Area (VCUs 574 through 578, 591 through 596, 597.1, and 597.2) (see Figure 1-5). These VCUs are used to describe the locations of specific resources in the Project Area.

Wildlife Analysis Areas

Wildlife Analysis Areas (WAA's) are Forest Service land divisions that correspond to Minor Harvest Areas used by the Alaska Department of Fish and Game (ADF&G). Approximately 190 apply to the Tongass and all or part of four WAA's (1318, 1319, 1323, and 1421) to the Control Lake Project Area. They are used in the *Subsistence*; *Water, Fish, and Fisheries*; and *Wildlife* sections.

Geographic Information System

Tongass National Forest resource data resides in an electronic database formatted for a GIS. The Forest Service uses GIS software to assist in the analysis of these data. Much of the data consists of electronic "map layers," each representing a particular resource or attribute (i.e., vegetation types, soil types, recreation places). Specific information gathered for the Control Lake Project Area was added to the Forest Service information already contained in the system to generate spatial analyses of alternatives and effects. GIS plots displaying resource data in map format and tables based on electronically measured areas and lengths are found throughout this EIS.

General Project Area Description

The Control Lake Project Area encompasses a large part of the central portion of Prince of Wales Island (see Figure 1-1). The area includes diverse terrain from inlets, bays, and beach fringes to alpine slopes and ridges. A variety of land forms and vegetative communities exists between the two elevational extremes. Over 90 percent of the Project Area land is forested with slightly more than half considered commercial forest land. A majority of the commercial forest land is classified as old growth. The most prolific conifer species found in the area are western hemlock and Sitka spruce. The Thorne River drainage is a major component of the landscape in the eastern portion of the Project Area. Muskegs and lakes, both large and small, are found across the Project Area.

The forests, shorelines, streams, and rivers of Southeast Alaska provide habitat for over 300 species of birds and mammals. Management Indicator Species (MIS) in the Project Area include the Sitka black-tailed deer, black bear, river otter, marten, gray wolf, Vancouver Canada goose, bald eagle, red-breasted sapsucker, hairy woodpecker, and brown creeper. Anadromous and resident fish occupying Project Area streams are important to sport, commercial, and subsistence users throughout Southeast Alaska. Coho and pink salmon are the MIS that represent anadromous fish, and Dolly Varden char represents resident fish for the Control Lake Project Area.

The largest communities near the Project Area are Klawock and Thorne Bay. The small communities of Coffman Cove and Naukati are also near the Project Area. The Island road system connects these communities with Hollis (south of the Project Area), which is the only Alaska Marine Highway ferry terminal on Prince of Wales Island.

3 Affected Environment

Climate and Air Quality

Key Terms

Ambient air—that air, external to building, encompassing or surrounding a specific region.
Ambient air quality standard—the prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.
Class I airshed—one of three classes of areas provided for in the Clean Air Act for the Prevention of Significant Deterioration program. Class I airsheds are the "cleanest" and receive special visibility protection.
Class II airshed—the second of three classes of areas provided for in the Clean Air Act. Class II airsheds have no specific attainment criteria.

Climate

The maritime influences of the Pacific Ocean create a moderate climate in Southeast Alaska. The result is a cooling influence in the summer and warmer winter temperatures than would be expected for these latitudes. Normal temperatures range from about 40°Fahrenheit (°F) to 65°F in summer, and from the high teens to about 40°F in the winter. During the warmer months, temperatures are highest inland and lowest along the coast, while the reverse is true in the colder months. The majority of climate stations in Southeast Alaska are near sea level and may not reflect conditions at higher elevations.

The north Pacific Ocean also generates low pressure weather systems that move onshore and produce abundant cloud cover. These low pressure systems also generate gale-force winds (greater than 32 mph). Gale-force winds occur year-round with the vast majority occurring in the fall and winter. Table 3-1 shows the number of days between 1953 and 1978 that strong winds occurred in the area. Over 80 percent of the gale-force winds reported in this period were from the south or southeast.

The Project Area has complete cloud cover about 85 percent of the year. These clouds inundate the area with precipitation. Precipitation gages are located near sea level in Craig and Hollis. Records are short, reliable averages are not available, and gaps occur in some records. Information on meteorological processes occurring inland and at higher elevations does not exist. Figure 3-1 shows average monthly precipitation in 1991 and 1992 for Craig and Hollis. The station values show that Craig and Hollis receive the most precipitation in fall and winter, and receive the least precipitation in June and July. High precipitation persists through the middle of November when intermittent snowfall occurs. Snowfall varies according to elevation and distance inland from the coast. Snow accumulation below 500-feet elevation is short-lived, generally melting off within a few days because of warmer temperatures and rain.

Table 3-2 shows mean annual summer and winter temperatures, precipitation, and snowfall for the portion of Prince of Wales Island that includes the Control Lake Project Area.

Air Quality

Because of the relatively pristine nature of Southeast Alaska, there is a general lack of ambient air monitoring data to characterize undeveloped areas. Some ambient monitoring occurs near a few of the large potential air pollution sources, such as pulp mills; however, those data are not representative of the area as a whole. The air flow from the Gulf of Alaska is not tainted by industrial air pollution and, in the absence of specific data to the contrary, can be expected to meet all standards for protection of public health and welfare. Local sources of airborne particulates include motor vehicle emissions, motor vessels and

Table 3-1

Number of Days, by Month, with Winds Over 30 Miles Per Hour[1/]

Month	Miles per Hour 31-35	36-40	41-45	46-50	51-55	56-60	Total Days
July	3						3
August	5	4					9
September	11	7	3		1		22
October	67	45	13	4	3		132
November	58	41	5	8	1		113
December	64	39	9	9	2	3	126
January	70	29	5	6	2	2	114
February	60	31	2	8			101
March	25	9	8	4			46
April	32	9	7	2			50
May	8	5	2				15
June	11	1	1				13

SOURCE: Harris, 1989.

1/ Daily fastest mile wind speed is obtained by measuring and averaging instantaneous wind velocities over 1 minute once each hour. The highest of all the 24 hourly measurements for the day is called the fastest mile and is included in published reports. National Oceanographic and Atmospheric Administration (NOAA) Meteorological Station at Annette Island, Alaska, 1953-78.

Table 3-2

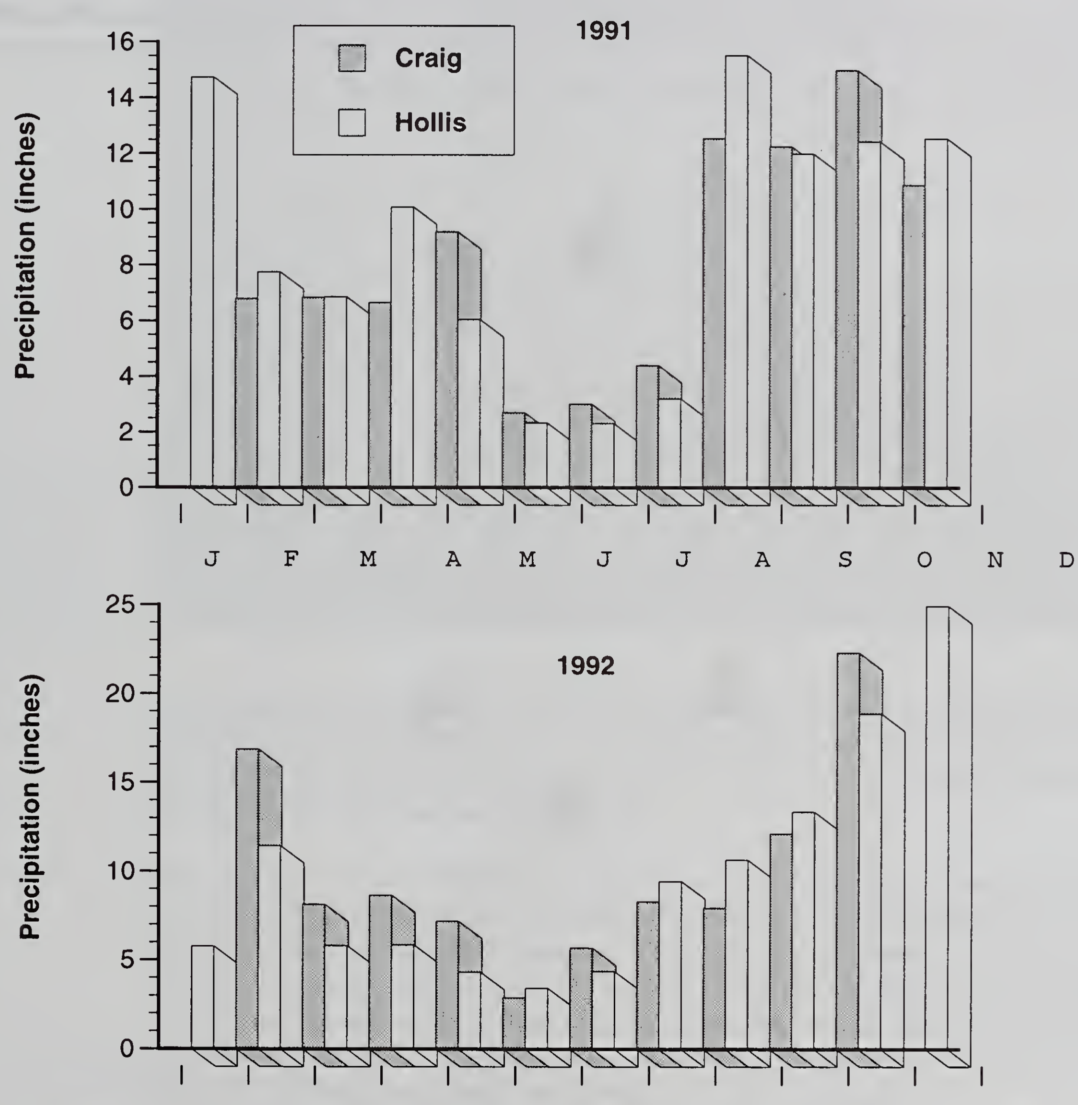
Mean Yearly Summer and Winter Temperatures, Precipitation, and Snow Accumulation for Craig and Hollis

Recording Station	Mean Summer Temperature (°F)	Mean Winter Temperature (°F)	Mean Precipitation (inches)	Mean Snow (inches)
Craig	55.0	34.8	106.47	35.7
Hollis	56.6	33.7	109.69	14.0

SOURCE: Alaska Climate Center Technical Note No. 3, 1986.

Figure 3-1

Average Monthly Precipitation in Craig and Hollis, 1991 and 1992



cruise ships, dust, residential and commercial heating sources, marine traffic, a limited amount of prescribed burning, and burning of wood debris at sawmills. The KPC pulp mill at Ward Cove near Ketchikan was closed in early 1997 and is no longer a source of air emissions.

Vehicles and home heating, particularly wood-fired heating, contribute to regional particulate matter concentrations. Alaska has had localized problems with wood smoke, and has issued regulations that limit open burning and other air pollution-generating activities between November 1 and March 31 in wood smoke control areas. The wood smoke control areas do not include the Control Lake Project Area. Open burning may be restricted in the Project Area when an air quality advisory is issued by the Alaska Department of Environmental Conservation (ADEC) (AAC 50.030). The ADEC has the primary responsibility for attaining and maintaining State and Federal ambient air quality standards in the Project Area. The Forest Service cooperates with ADEC to protect air quality in National Forests. The entire area is a designated Class II airshed for purposes of Prevention of Significant Deterioration. This designation allows moderate industrial air pollution concentration increases, compared to the more restrictive requirements of Class I airsheds.

Geology, Minerals, and Karst

Key Terms

Carbonate rock—rocks such as limestone and dolomite which contain a high content of calcium carbonate ($CaCO_3$).
Cave—any naturally occurring void, cavity, recess, or system of interconnected passages that occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.
Cave resources—any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.
Glacial till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
Graywacke—fine-grained, sedimentary rock made up of quartz, feldspar, and dark mineral grains.
Igneous rock—formed by the cooling and consolidation of magma (lava).
Karst—a type of topography that develops in areas underlain by soluble rocks, primarily limestones.
Lithology—the science dealing with the mineral composition and structure of rocks.
Metamorphic rock—rock whose original compounds, textures, or both have been transformed to new compounds or textures as a result of high pressure, temperature, or both.
Phyllite—a slaty rock with lustrous surfaces due to the high content of mica flakes.
Pleistocene—the epoch forming the first part of the Quaternary period, originating about one to two million years ago, and ending about 10,000 years ago.
Sedimentary rock—formed by chemical precipitation or sedimentation of mineral grains deposited by water, wind, or ice.
Sinkhole—relatively shallow, bowl- or funnel-shaped depressions ranging in diameter from a few feet to more than 3,000 feet.

Introduction

This chapter provides a view of the regional geologic features and parameters that influence the minerals and karst resources of the Control Lake Project Area. Key elements of these geologic features are the lithology and structures that controls the mineral deposition and the karst forms in the limestone of the region.

Geology

The geology of the Control Lake Project Area is controlled by the faulted middle Paleozoic and Cretaceous rock of the Alexander Belt sequence. The predominant rock units are the Devonian-age, variably metamorphosed, volcanics and graywacke of the Descon Formation and the related formations—Staney Creek and Luck Creek. There are two igneous intrusions of Cretaceous-age diorite or quartz diorite within the area. Discontinuous pods of limestone, possibly aligned in a contemporaneous horizon, have been mapped within and slightly above the base of the Staney Creek Formation.

Faulting has resulted in deep northwest trending lineaments which generally parallel the main valleys within the Project Area. In most cases the valley floors contain exposures of phyllite or argillite while the ridge lines have exposed greenstone or andesite. Most of the faults extend for several miles across the Project Area.

Geomorphology

The Control Lake Project Area exhibits two distinct geomorphic sub-provinces. The western and northern part of the area contains moderate to rugged ridge and canyon terrain while glaciation of the central eastern part of the area has evolved a large open valley containing numerous drumlins. Drumlin alignment indicates glacial flow from the west, Control Lake, and from the north, Thorne Lake, directed towards the southeast, Thorne Bay and Salt Chuck. Aerial photo mosaic maps display these coalescing drumlins in a spectacular manner.

These geomorphic provinces have been affected by the Cretaceous intrusion of massive diorite bodies in the northeast and south portions of the area. These intrusions have interrupted the northwest trending valley and ridge system and possibly influenced the convergence and southeast flow of the glaciers.

Two other areas that may contain buried intrusions have been identified. One is north of Control and Cutthroat Lakes and the second is the Kogish Mountain upland. These uplands alter the valley and ridge terrain in a manner similar to the observed intrusions, but no igneous rock was observed in these areas.

The steep canyon walls exhibited relatively few unstable slopes. Rockfalls were present from slopes inclined near-vertical to about 70 degrees. Landslides were found where remnants of glacial till remain on the canyon slopes. These failures occurred on slopes inclined as low as approximately 45 degrees. Lower slopes display minor ravelling as a result of over-steepening caused by stream bank erosion.

Stream courses appeared to be relatively free of sedimentation. In many places the streams flow over water-scoured rock sills, which infer possible regional (or even localized) uplift since glaciation. Localized features which appear to be raised beaches or captured streams also infer regional uplift. These are found mainly along the west coast of Prince of Wales Island. Most streams flow into the estuaries and embayments such as Big Salt Lake, Salt Chuck, Thorne Bay, or Salt Lake Bay.

Stratigraphy

The stratigraphy of the Project Area is dominated by the Silurian-age Descon Formation which contains graywacke and shale that has been metamorphosed in varying degrees to greenstone and phyllite. The older Silurian-age Luck Creek Formation is exposed in the northeastern part of the region, and the younger Devonian-age Staney Creek Formation is located in the north-western part of the area. Outcrops of the Silurian-age Hecata Limestone were not found in the Project Area.

The age relationships of the three formations is not clear. All three formations may have been deposited at the same time but influenced by slightly different source areas. The Descon Formation appears to be the older unit in the southwestern part of the region while the Luck Creek Formation may be slightly older but definitely appears to interfinger the Descon near the central part of the Project Area. The Staney Creek area contains similar lithology and may also interfinger the Descon and Luck Creek Formations; however, it also contains pods of limestone which, while not as pure as the Hecata on Hecata Island and Prince of Wales Island to the north, contains similar fossils and probably a similar age relationship.

Lithology

The rock types contained within these formations consist of clastic sediments-sandstone and shale, nonclastic limestone deposited in isolated pods, and varying degrees of metamorphosed components of these rocks, such as greenstone and phyllite. Andesite flows were mapped as well as intrusions of andesite and diorite with their metamorphosed equivalents. Metamorphism appears to become more intense with proximity to the Cretaceous intrusions. Other rock types such as basalt, glacial till, conglomerate and red volcanic sandstone were observed scattered through the area.

Eberlein et al. (1983) indicate that the formations appear to change in lithology to the east from a calcareous marine environment to a volcanic, volcanoclastic rock type. Study of this area reinforces this indication. In addition, the formations tend to become more intensely metamorphosed towards the southeast. This may be more of a local influence from the presence of the igneous intrusions.

Structure

The region is dominated by the northwest trending faults described by Eberlein (1984). This faulting probably developed as tectonic forces drove these islands into the North American Plate at an oblique angle resulting in profound shearing stress. The mapping indicated the possibility that a normal or reverse component may also be present on these faults and the near-parallel ridges and valley structure may be the result of tilting and uplift of the sheared island plate. It also appears that some of the faults are truncated by the Cretaceous-age igneous intrusions.

Minerals

Mineralization has occurred in economic concentrations southeast of the Control Lake Project Area. The Salt Chuck and Brown and Rush Mines were active operations until the 1940s. Prince of Wales Island produced copper, gold, silver, and marble in economic quantities with the bulk of production occurring between 1912 and 1923.

There are no mines located within the Project Area. A total of seven prospects and occurrences were identified within the Project Area boundaries during the field efforts. One prospect located north of Black Bear Lake was being evaluated by the owner during summer 1993. The other six occurrences exhibited mineral shows of varying degree. The U.S. Bureau of Mines indicated that there are no current claims staked within the Project Area.

The minerals observed within the Project Area are consistent as to apparent origin, mode of deposition and concentration. The deposits are injections of chalcopyrite, pyrite, bornite, and possibly sphalerite. The deposits consist of fracture filling materials that, except at Black Bear Lake are no more than coatings on the fractures. At Black Bear Lake, a well-developed skarn has developed around the diorite intrusion. Within this skarn zone large clots of injected pyrite and chalcopyrite are visible.

The occurrences observed during the 1993 field season likely do not represent viable economic mineral deposits. Because much of the hard rock, andesite, greenstone, and quartzite contain high percentages of pyrite, this material is not suitable for use as concrete aggregate. In addition, the level of metamorphism found in the region indicates that hydrocarbon deposits are not likely. Limestone outcrops are generally small and isolated. Many in the northern part of the Project Area contain sand or clay which makes the rock soft, friable, and not of economical value.

Currently, the phyllite and quartzite are being used as road ballast and boulders are used as jettystone. This rock appears to degrade with use and probably has a limited useful life. No aggregate sources for general commercial use have been located within the Project Area.

Karst

Carbonate rock (limestone) located within the Control Lake Project Area is represented by less than 7,000 acres of bedrock outcrop. Carbonate rock, such as limestone and marble, dissolves in naturally occurring acidic waters. Acidic runoff flowing downslope across limestone exposures will dissolve epikarstic (i.e., surface) features such as rills, runnels, and grikes. Where faulting or jointing provides for deeper penetration, these surface solutions may dissolve out vertical conduits which, when enlarged, form sinkholes. Lateral underground movement of acidic waters can develop extensive cave systems that provide protected environments for both flora and fauna.

Extensive field studies have been performed by the Forest Service (Baichtal, 1991) that highlight the extensive complement of living species and other features that can be found in the cave systems of the region. The 1993 field study did not evaluate any caves for fauna.

In the Project Area, the limestone outcrops occur as individual and isolated pods rather than as continuous and extensive bands of limestone. It is likely that this isolated distribution also characterizes the limestone at depth. Consequently, the distribution of karst features at depth is most likely to be similarly isolated rather than extensive. Most outcrops are karstic with a well-developed epikarst as well as several caves.

The karstic limestone pods appear to be within the Staney Creek Formation and are located slightly above the base of that formation. These discontinuous limestone pods were probably deposited during the same time span. As the outcrop zone trends east and north, the quality of the limestone changes from a massive nonfossiliferous limestone to a granular texture with well preserved fossils. The outcrop band curves westward and leaves the Project Area about 5 miles south of the north Project Area boundary. Outside of the north Project Area boundary several outcrops of black, fossiliferous limestone were observed.

The project field work resulted in the discovery of karst and caves in several of the units originally proposed for harvest. Site investigations were not conducted to determine the extent of the deposits or of the caves within the deposits. The presence of resurgences mostly on the downslope contact of the limestone outcrop infers a limited downdip lateral extent of the outcrops with the likelihood of limited karst development underground.

Soils

Key Terms

Alluvium—stream-deposited sediment.
Colluvium—a deposit of sediment on a hillslope derived from mass movement (landslide processes).
Duff—vegetative material covering the mineral soils in forests, including the fresh litter and decomposed organic material.
Glacial till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
Mass Movement Index (MMI)—rating used to group soil map units that have similar properties with respect to the stability of natural slopes.
Mass movement—general term for a variety of processes by which large masses of earth material are moved downslope by gravity either slowly or quickly.
McGilvery soil—a shallow, forested, organic soil developed over bedrock.
Muck—decomposed plant material, with little evidence of the original plant remaining.
Muskeg (peatland)—a type of bog that has developed in depressions or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and sedges.
Outwash— alluvium deposited by streams originating from glaciers.
Riparian areas—encompass the zone of interaction between the aquatic and terrestrial ecosystems, and include riparian streamsides, lakes, and floodplains with distinctive resource values and characteristics.
Riparian Management Area (RMA)—the area including water, land, and plants adjacent to perennial streams, lakes, and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.
Sediment—solid materials, in suspension or transported by water, gravity, ice, or air.
Slip plane—surfaces along which differential movement takes place in soil or rock.
Soil productivity—capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.
Till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
V-Notch—a shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Introduction

Soils of Southeast Alaska are a fundamental part of the forest. They have evolved with the vegetation and climate and form the foundation of the forest ecosystem. The soil's integrity and stability determine the long-term productivity of the forest. The region's cool growing season temperatures and abundant rainfall greatly influence soil characteristics. Under these conditions, organic matter decomposes slowly and tends to accumulate. At the same time, nutrients are flushed from the mineral soil but are retained in the thick surface organic (duff) layer. If the duff layer is extensively disturbed, alder can invade the site and delay the regeneration of conifers.

Soil Groups

Soils are formed in either mineral materials (e.g., sand, silt, clay) or organic matter (decayed plant materials). For this analysis, soils within the Project Area are grouped by typical properties that influence the use and management of an area. Consequently, the mineral soils are discussed in general and then by more specific categories. The soils in the Project Area are composed of mineral soils (developed from decomposed rock materials) and organic soils (developed from decomposed plant materials). Within these two broad groups more specific

subdivisions occur. Five soil types are important in the Project Area: (1) the broad mineral soils group, composed mainly of sand, silt, clay, gravel, and rocks; (2) mineral soils formed over compact glacial till; (3) Tonowek and Tuxekan soils, made up of alluvial sand, silt, and gravel (also mineral soils); (4) organic soils, composed of decomposing plant tissues (muck); and (5) the McGilvery soil series, which is also an organic soil. This latter soil is composed of a thin, well drained layer of organic material overlaying bedrock. Figure 3-2 summarizes a variety of the characteristics of these soil groups. Appendix D displays the acres of these soil groups by watershed. Figure 3-3 is a map of the major watersheds in the Project Area.

Mineral Soils

Mineral soils originate from deposits of glacial till, outwash, lake deposits, alluvium, and colluvium. These soils have a potential for landslides when they occur on steep slopes. The mineral soil surface typically consists of partially decomposed organic material. Soil depths range from less than 20 inches to more than 20 feet. Drainage ranges from well to very poorly drained. These soils typically support a hemlock or hemlock-spruce vegetation series. Sites that drain poorly often support a mixed-conifer or western red cedar series. The glacial till and Tonowek and Tuxekan soils are also mineral soils. Mineral soils make up about 48 percent of the Project Area or 81,323 acres.

Glacial Till Soils

Glacial till soils are a type of mineral soil that formed in compact, poorly sorted deposits of glacial origin. These soils are typically found on lower valley sidewalls and low ridge tops. They are of management concern because of the potential for landslides. The dense, compact glacial till that underlies these soils is relatively impermeable. Water accumulates in the subsoil at the contact with this dense till, forming a layer that is relatively unstable and susceptible to sliding. They typically support western hemlock and yellow cedar forest types. Glacial till soils make up about 30 percent (50,868 acres) of the Project Area.

Tonowek and Tuxekan Soils

Tonowek and Tuxekan soils are a type of mineral soil found on stream bottoms, alluvial fans, and floodplains. In the floodplain zones near rivers, soils tend to be more poorly developed because of repeated sediment deposition during floods. They typically support a riparian community of water-dependent plants including Sitka spruce, devils club, and red alder. Tonowek and Tuxekan soils previously harvested for timber are now in various stages of secondary plant succession. About 1 percent of the Project Area (2,131 acres) is made up of these soils.

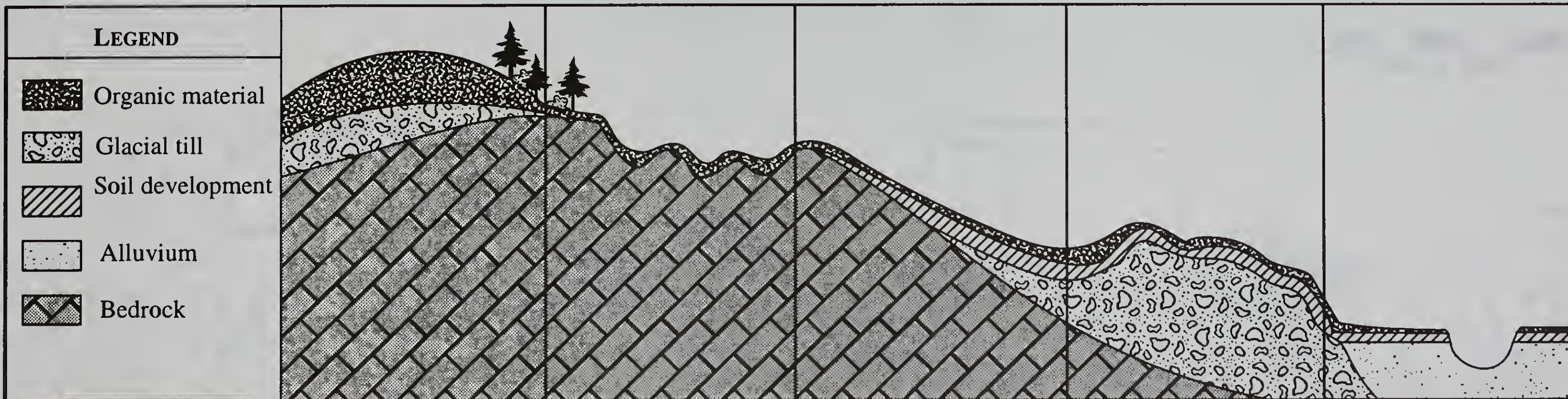
Organic Soils

Organic soils, common and widely distributed in the Project Area, are generally found on glacial deposits on relatively flat valley bottoms. Forested organic soils range from well to very poorly drained. Non-forested organic soils are usually poorly or very poorly drained. They range from about 3 inches to over 40 feet in depth. Organic soils in Southeast Alaska typically support a mixed conifer, western hemlock-yellow cedar, western hemlock-red cedar, or shore pine vegetation series. If non-forested, they support a muskeg or alpine meadow community. About 52 percent of Project Area soils (87,738 acres) are organic.

McGilvery Soils

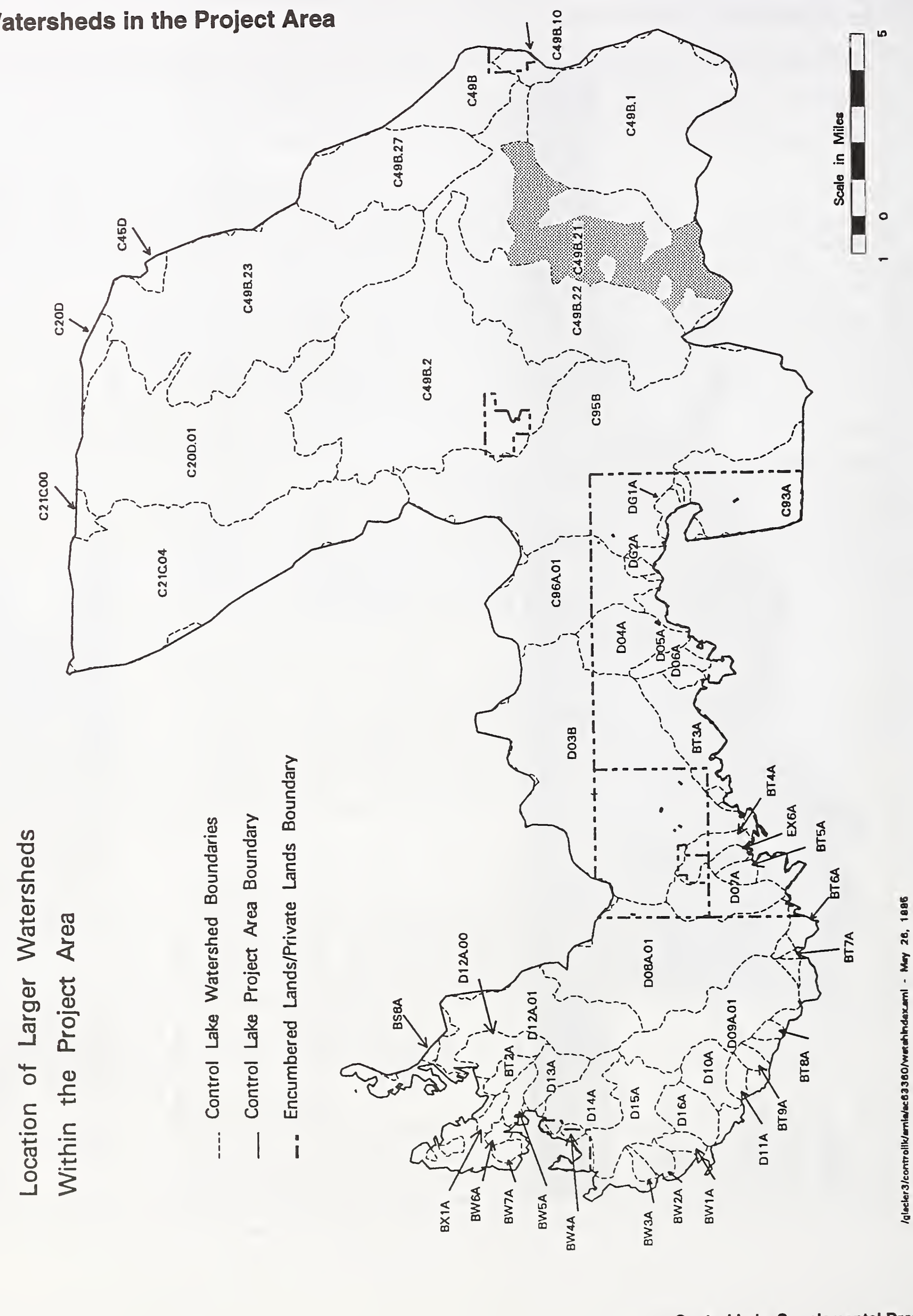
McGilvery soils are a type of organic soil that is well-drained and typically supports western hemlock or western hemlock intermixed with cedar and spruce. Because of its shallow depth, disturbance of the soil surface may result in exposure of the underlying bedrock. Restocking of forests on soil mapping units with greater than 41 percent McGilvery soils generally cannot

Figure 3-2
Soil Characteristics of Project Area



	Organic		Mineral		
	Organic (general)	**McGilvery**	**Mineral (general)**	**Till**	**Tonowek and Tuxekan**
Description	Thick layer, partly to completely decomposed plant materials	Forest litter and partly decomposed plant material over bedrock	Shallow to deep soils developing in residuum or colluvium	Thin surface, soils developing in glacial till	Shallow to deep soils of stratified sand and gravel
Texture	Peat, mucky peat, muck	Peat, mucky peat	Sandy loam to silt loam	Sandy loam to silt loam	Sand and gravel
Soil Depth	7" to > 6'	< 8"	1' to > 6'	< 20" to < 6'	> 6'
Drainage	Poorly and very poorly drained	Well drained	Well to poorly drained	Well to poorly drained	Well to moderately well drained
Major Forest Types	Nonforest and varied forest types	Western hemlock	Western hemlock, mixed conifer	Western hemlock, Western hemlock/ yellowcedar	Sitka spruce
Landform	Ridgetops, benches, depressions, valley floor	Upper backslopes of hills and mountains	Valley floors, hillslopes, mountain sideslopes, ridge slopes	Moraines, drumlins, valley floor deposits	Floodplains, stream stream terraces
Mass Movement Index Class	Generally low	Low	Low to very high	Low to very high	Low
Timber Site Productivity Class	Low to moderate	Medium to high	Medium to high	Medium to high	High
Wetland Habitat Potential	High	Low	Medium	Medium	Very high
Upland Habitat Potential	Low	Medium	High	High	Very high

Figure 3-3
Major Watersheds in the Project Area



be ensured within 5 years of final harvest; therefore, such sites are classified as unsuitable for timber production. About 4 percent (6,975 acres) of the Project Area is made up of these soils.

Soil Productivity

Soil productivity, which is the inherent capacity of a soil to support the growth of specific plants or plant communities (FSM 2554.03), is critical to the forest because it affects the productivity of most other forest resources. Tree growth and wildlife and fish habitat are often associated with soil productivity (the soil component of long-term site productivity). In the Project Area, timber site productivity of mineral soils ranges from very high on floodplains, till plains, and most other lowlands, to medium to high on moderately well- to well-drained soils, to low on somewhat poorly to very poorly drained soils. Timber site productivity on poorly and very poorly drained organic soils, regardless of elevation or exposure, is generally much lower than the productivity of mineral soils.

Timber management activities can influence soil productivity and its related nutrient content in a number of ways. Landslides, surface erosion, severe logging disturbance, or displacement by roads, skid trails, landings, or rock pits can cause removal of the surface layer. Soil damage can also result from compaction or puddling, which impairs soil porosity and drainage, and reduces productivity. Changes in soil productivity that last beyond the planning period are considered to be significant impairments. A 15 percent reduction in inherent soil productivity potential is the threshold used for setting values for change in measurable or observable soil properties associated with long-term productivity (FSM 2554.03).

Erosion

Two major types of erosion—surface erosion and landslides—occur in the Project Area and are influenced by timber harvest activities.

Surface Erosion

Two types of surface erosion occur as a result of timber harvest—surface erosion on the harvested areas and road surface erosion. In the forested areas of Southeast Alaska, the organic mat and mineral soil can absorb rainfall even at the highest precipitation levels. Consequently, overland flow by water and any resulting surface erosion of soil particles by processes such as sheetflow, rill, and gully erosion is uncommon. However, erosion can occur when mineral soils are exposed. The rate of erosion depends primarily on the amount of vegetation groundcover, erodibility of the soil, and slope steepness.

Road erosion contributes far more to stream sedimentation than does surface erosion. Road surfaces are barren and traffic breaks down the sublayers of roads into fine particles, producing sediment. Also, roads are often hydraulically connected to streams by drainage ditches. At stream crossings, roads can contribute significant amounts of fine sediment to drainages (Reid and Dunne, 1984). The amount contributed depends greatly on use. Excessive road and surface erosion results in the introduction of fine sediment to stream gravels which can affect fish spawning, growth, and habitat (see *Water, Fish, and Fisheries* Section).

Some of the Project Area is extensively roaded from previous logging operations. Most of the roads are in the lower Logjam Creek area, in the vicinity of Control Lake, or in the Steelhead and Rio Beaver Creek watersheds.

Areas with timber harvest occur along the lower Thorne River area, at the northern end of the Western Peninsula, and in watershed C49B.2700. Surface erosion is uncommon in Southeast Alaska because of the thick duff layers protecting the soil. Use of BMP's during timber harvest minimizes exposure of mineral soil.

Landslides

Landslides are the main source of hillslope erosion in Southeast Alaska. Many landslides occur during or immediately after periods of heavy rainfall when soils are saturated (Swanston, 1969).

Landslides usually occur on steep slopes that have soils with distinct subsurface "slip" layers (slip-planes), such as compact glacial till or bedrock that parallels the ground surface. These areas have a high likelihood of naturally occurring landslides or landslides caused by blasting rock or road pioneering, side casting of excavated material, or logging practices that cause substantial surface disturbance.

Landslides in the Project Area consist of two main types: debris flows and debris avalanches (Swanston, 1969). Debris avalanches are shallow failures, limited mostly to the colluvial and soil layers. These landslides begin on steep slopes and commonly enter steep drainages, picking up moisture and becoming debris flows. Prince of Wales Island has one of the higher landslide frequencies in Southeast Alaska (Swanston, 1969). Swanston and Marion (1991) showed that in clearcut areas on Prince of Wales Island landslides occurred at a rate 3.5 times greater than that on undisturbed slopes.

The Forest Service's classification system for landslide hazards is the Mass Movement Index (MMI). The system ranks site characteristics, soil types, and slope angle into four categories of hazards—MMI1 through MMI4—corresponding to low, moderate, high, and very high landslide hazard. Soils with a very high MMI are excluded from the tentatively suitable Commercial Forest Land (CFL) base and are not harvested. Most of the MMI3 and MMI4 soils in the Project Area are in the four mountainous regions: the northern portions of the Klawock Range, the Rio Beaver and Rio Roberts watersheds (Watersheds C49B.2100 and C49B.2200), the Kogish Peak area, and the unnamed mountains to the northwest of the Thorne River.

Mass Movement Index (MMI)

MMI ratings tell how susceptible soil groups are to landslides under natural conditions.

MMI1 - low potential
MMI2 - medium potential
MMI3 - high potential
MMI4 - very high potential

Of 140 landslides identified during a 1993 storm on Prince of Wales Island, 87 percent started in MMI3 soils, while none began in MMI4 soils (USDA Forest Service, 1994a). Analysis showed that 71 percent of the landslides were in harvested areas. However, the acreage of land disturbed by the slides was only 20 percent higher in harvested areas than in old-growth areas. This is likely because landslides originating in old growth tend to be larger (Swanston and Marion, 1991).

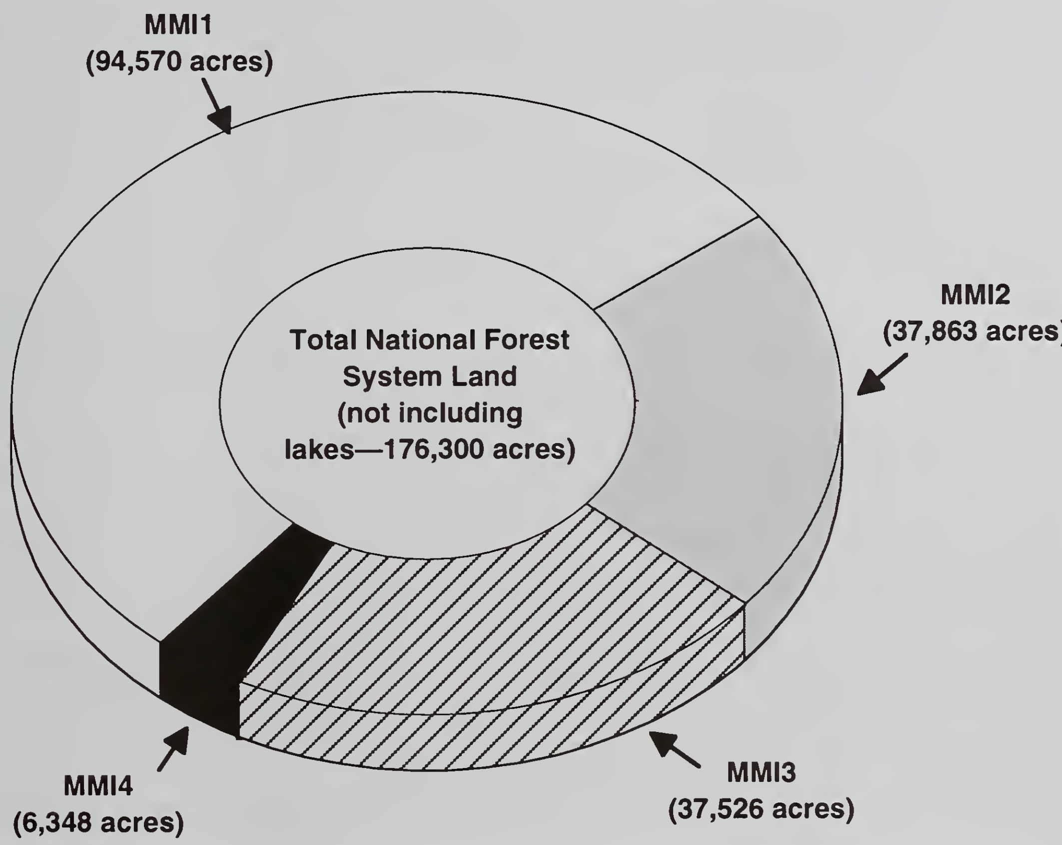
Management-related landslides in Southeast Alaska have two sources: harvested slopes and logging roads. When an area is logged, the tree roots, an important part of the cohesive strength of the soil, gradually deteriorate. After three to seven years, the root strength on hillslopes reaches a minimum (Swanston, 1969). Soils in logged areas also tend to be more saturated in the spring than their unharvested counterparts because of more snow accumulation and less moisture loss through evapotranspiration. This may increase the potential for failure by increasing shear stress and reducing soil strength.

Logging roads can be a major source of landslides, often because of improper road drainage. The volume of sediment from road-related landslides can be several orders of magnitude greater than sediment from the road surface. Several studies in the Pacific Northwest indicate that roads cause many more landslides than the timber harvest (Megahan and Kidd, 1972; Lyons and Beschta, 1983). However, data collected by Swanston and Marion (1991) show that in Southeast Alaska only 13 percent of the management-related landslides were associated with roads.

Figure 3-4 shows the MMI classification distribution for soils in the Project Area. Most of the Project Area soils fall within the MMI1 category (54 percent), which also includes some unclassified wetland areas. MMI2 and MMI3 soils make up about 21 percent of the Project Area each and only about 4 percent carry a MMI4 rating. Field verification added about 1,040 acres to the MMI4 layer.

Figure 3-4

Soils by Mass Movement Index



This page left intentionally blank

Wetlands, Floodplains, and Riparian Areas

Key Terms

Aquatic ecosystems—the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein.

Channel type—the defining of stream sections based on relief, landform, and geology.

Estuarine—deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but which have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is diluted by freshwater runoff.

Forested wetlands—wetlands that have forest cover.

Hydrophytic vegetation—plants typically found in wetlands and dependent upon wetland moisture regimes for growth and reproduction.

Muskeg (peatlands) —a type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.

Primary succession—vegetation development that is initiated on surface exposed for the first time, which has never supported vegetation before.

Riparian areas—encompass the zone of interaction between the aquatic and terrestrial ecosystems, and include riparian streamsides, lakes, and floodplains with distinctive resource values and characteristics.

Riparian Management Area—the area including water, land and plants adjacent to perennial streams, lakes and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.

Secondary succession—the process of reestablishing vegetation after normal succession is disrupted by fire, cultivation, timber harvest, windthrow, or any similar disturbance.

Wetlands—areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40 CFR 230.41(a)(1)). Federal agencies having statutory authority over Federal lands are required to preserve or enhance the natural and beneficial values of wetlands in carrying out their responsibility to (1) acquire, manage, and dispose of lands and facilities; (2) provide Federally undertaken, financed, or assisted construction and improvements; and (3) conduct Federal activities and programs affecting land use (42 U.S.C. 4321 et seq.).

The U.S. Army Corps of Engineers Wetlands Delineation Manual (COE, 1987) provides the standard for determining a site's wetland status. In addition, DeMeo and Loggy (1989) have developed wetland identification specific to Southeast Alaska's vegetation communities. Under COE (1987), sites are considered wetlands when they meet criteria regarding soil, hydrology, and vegetation. Generally, wetlands are those sites that remain water-saturated long enough for hydrophytic vegetation to dominate and certain soil characteristics to develop. The DeMeo and Loggy (1989) procedure, which is used here, evaluates the vegetation and soil layers of the GIS

database and then assumes the presence of the wetland hydrological criteria. Their procedure calculates wetland acreage based on the general percentage of the vegetation and soil types within mapping units and includes lakes, ponds, estuaries, streams, muskegs, and forested wetlands. Consequently, this procedure generates an acreage of potential wetlands rather than a wetland delineation and associated acreage.

Wetland Types

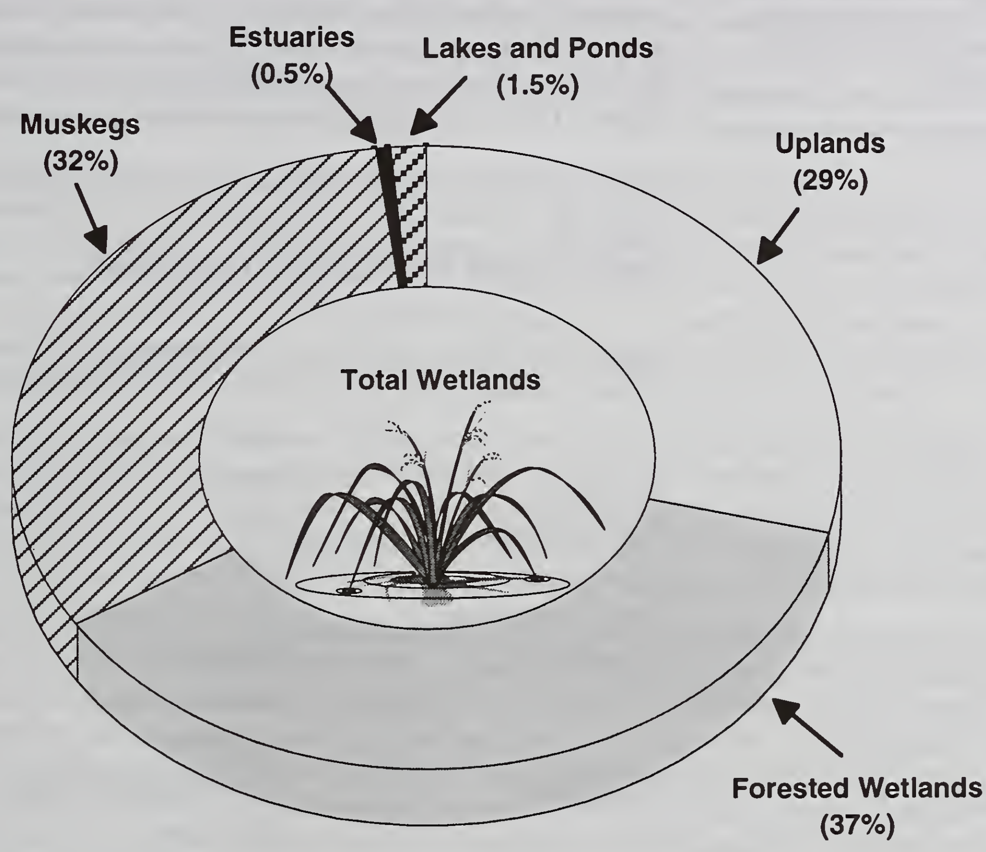
Types of wetlands include estuaries, lakes and ponds, and other plant communities formed on both mineral and organic soils (Cowardin et al., 1979). Figure 3-5 displays the acreage of the different types of wetlands in the Project Area. Streams and rivers are also considered wetlands. The major wetlands in Southeast Alaska are made up of both forested sites on poorly drained organic and mineral soils and nonforested, herbaceous plant-dominated sites on organic soils (muskegs or peatlands). Forested wetlands and muskegs make up approximately 64,013 and 55,505 acres, respectively, of the Project Area. Small estuaries including muddy subtidal areas are located at the mouths of the several unnamed streams that flow into Nossuk and Salt Lake bays on the Western Peninsula. Estuaries make up about 779 acres of wetlands adjacent to the Project Area. Lakes and ponds, widely distributed over the Project Area, compose about 2,427 acres of the Project Area, with the greatest concentration along the Honker Divide of the Thorne River and Hatchery Creek drainages. They can have deepwater or shallow nearshore habitat. Major lakes included the Twin and Thorne lakes of the Thorne River, Lakes Galea and Butterfly of Hatchery Creek, Control and Balls lakes of the Control Lake Creek drainage, Cutthroat Lakes of Cutthroat Creek, Snakey Lakes of the North Thorne River, and Angel and Foot lakes of Goose Creek. A more detailed description of lakes can be found in Appendix D.

Certain types of forested wetlands are now given greater protection under the new Forest Plan (see ROD for TLMP 1997). These wetlands are those occurring on Kaikli, Karheen, Kitkun, and Maybeso soil series. They are now given greater protection because the scientific information

Muskeg

Figure 3-5

Wetland Types in Project Area



related to the effects of timber harvesting on these soils is incomplete and specific concerns exist. Harvesting timber on these soil types is to be avoided except for small inclusions of these soils (2 acres or less) within a unit. In the Project Area these soils are found in greatest abundance (based on GIS analysis of soil associations and complexes) in the Logjam Creek (C21C), Hatchery Creek (C20D), Upper Thorne River (C49B.23), Control Creek (C49B.20,.24,.25), Elevenmile (D09A), and adjacent (D08A) watersheds.

Wetland Values and Functions

Wetlands are associated with significant values and functions (Reppert et al., 1979). Values are socioeconomic and include wildlife viewing and harvest, commercial fishing, development, community water supplies, actual and potential recreation, and timber harvest. Functions are ecosystem attributes and can be organized as follows:

- Physical functions—flood conveyance and retention, coastal erosion barriers, groundwater recharge and discharge, heat absorption, and sediment collection.
- Chemical functions—acidic water pH levels, high tannins, and the ability to accumulate significant carbon and nitrogen.
- Biological functions—timber production (generally in lower volume classes) and provision of critical habitat for fish (notably salmon) and wildlife (notably waterfowl and bears).

Floodplains

> *The 1997 TLMP further subdivided Class III streams into Class III and Class IV streams. See the Glossary for the current definitions.*

Floodplains usually contain sediments carried by the stream or river and deposited in slack-water areas adjacent to the channels during periods of high water. Floodplains are defined as areas subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year. They generally are associated with larger streams such as the Thorne River, as well as Hatchery, Rio Roberts, and Rio Beaver creeks. Significant floodplains are usually associated with Class I streams, although larger Class II streams can form floodplains. Class III/IV streams rarely have floodplains. (See Glossary for definitions of Class I, II, III, and IV Streams.) Nutrient-rich sediments underlain by coarse, well-drained sediments make floodplains the most productive lowland timber sites on the Project Area. They typically support a Sitka spruce series or shrub plant communities. No flood hazard studies have been conducted for the Project Area. Table 3-3 shows the acreage of significant Project Area floodplains by watershed (refer to Figure 3-3 for a map of major watersheds in the Project Area).

Table 3-3
Project Area Floodplains (in acres)[1/]

Name	Watershed	Floodplains
	000Z	17
103-80-37	BT2A	8
Hatchery Creek	C20D	91
Logjam Creek	C21C	56
North Thorne River	C45D, C49B.2700	71
Thorne River	C49B, C45D	1,338
	C49B	202
	C49B.0001	64
Goose Creek	C49B.1000, C49B.1100	
	C49B.1200	40
Control Creek	C49B.2000, C49B.2400	
	C49B.2500, C49B.2600	304
Rio Beaver	C49B.2100	141
Rio Roberts	C49B.2200	284
Upper Thorne River	C49B.2300	233
Steelhead Creek	C95B	453
Election Creek	C96A	45
103-60-05	D08A	66
103-80-50	D15A	37
James Creek	D16A	21
Total Project Area[2/]		2,131

SOURCE: Forest Service, Ketchikan Area, GIS database.

1/ Watersheds not in the table do not have mapped floodplain acreages.

2/ The floodplain acreage listed for Thorne River includes acreages for its component watersheds, including North and upper Thorne Rivers.

Floodplains can be sensitive to road-building and timber-harvesting activities. These activities can modify the ability of floodplains to store and route flood waters and alter stream channel morphology. Such modification can change the nature and ability of the channel to route sediment and water by eliminating woody debris (Smith et al., 1993) and varying water and sediment inputs.

Executive Order 11988 directs Federal agencies to lead and take action to the extent possible to prevent the long- and short-term adverse effects caused by occupying and modifying floodplains. Agencies are required to (1) avoid the direct or indirect support of floodplain development whenever there are practicable alternatives; (2) evaluate the potential effects of any proposed action on floodplains; (3) ensure that planning programs and budget requests consider flood hazards and floodplain management; and (4) prescribe procedures to implement the policies and requirements of the Order.

Riparian Management Areas

The NFMA, Section 219.27 (12)(e), requires that Riparian Management Areas be established to conserve soil and water resources and to prevent permanent impairment of the productivity of the land. Riparian Management Areas are not zones of exclusion; rather, they are areas where topography, vegetation, soil, climatic conditions, management objectives, and other factors are to be considered in determining management practices and constraints. Riparian Management Areas comprise the aquatic and riparian ecosystem, and the adjacent floodplain, wetlands, and upland areas with potential to deliver sediment to channels.

Riparian Management Areas have distinctive resource values and characteristics. Riparian vegetation is important in maintaining stream bank stability and floodplain integrity. Such vegetation slows water velocity on the floodplain while its roots inhibit erosion along stream and river banks. Riparian vegetation provides shade, leaf, and needle litter which fuels aquatic food chains, and large woody debris (LWD), an important component of instream fish habitat.

Standards and guidelines described in the 1997 TLMP include several levels of riparian and stream protection: minimum TTRA buffers, extended-width, no-cut buffers to cover the Riparian Management Area, an additional area managed to provide for windfirmness of the Riparian Management Area, and other BMP's prescribed in the field based on site-specific analysis. The TTRA requires riparian buffers of no less than 100 feet horizontal distance on each side of all Class I streams and those Class II streams that flow directly into Class I streams. Extended-width, no-cut buffers to cover the Riparian Management Area are applied as identified in the stream process group direction (RIP 2, III, E) of the Riparian standards and guidelines (TLMP, 1997). Site-specific adjustments to these extended-width buffers may be made after a watershed analysis is completed and as long as stream process group objectives can be met. In addition to no-cut buffers, the standards and guidelines of the new Forest Plan (1997) require that an area beyond the no-cut buffers be managed to provide for a reasonable assurance of windfirmness of the Riparian Management Area. Special attention is to be paid to the area within one site-potential tree height of the Riparian Management Area. Tables 3-4 and 3-5 show Riparian Management Area acreages and areas of previously harvested Riparian Management Area in the Project Area.

Table 3-4
Riparian Management Area in the Control Lake Project Area (acres)[1/]

Name	Watershed	Class I Stream	Class II Stream	Class III Stream	Lake	Riparian Soils	MMI4	Totals
	000Z	67	26	20	0	14	30	158
	BS7A	6	5	0	0	0	0	11
	BS8A	22	0	0	0	0	0	22
	BT1A	5	0	0	0	0	0	5
103-80-37	BT2A	39	39	26	0	5	0	109
103-60-03	BT6A	9	0	0	0	0	0	9
103-60-01	BT7A	12	0	0	0	0	0	12
	BT8A	8	12	2	0	0	0	21
	BT9A	0	11	5	0	0	20	36
103-70-03	BW1A	21	48	13	0	0	0	82
103-80-56	BW2A	27	38	1	0	0	0	65
103-50-53	BW3A	9	4	4	0	0	0	17
	BW4A	0	0	1	9	0	0	10
103-80-42	BW5A	34	8	18	0	0	0	60
	BW6A	17	6	2	0	0	0	25
	BW7A	5	0	0	34	0	0	39
	BW8A	7	0	0	0	0	0	7
	BW9A	15	0	0	10	0	0	25
	BX1A	12	6	0	34	0	0	52
Hatchery Creek	C20D	984	552	343	433	46	437	2,795
Logjam Creek	C21C	1,511	562	341	436	22	195	3,067
	C26C	0	0	0	0	0	0	0
North Thorne River	C45D, C49B.2700	761	27	38	389	26	28	1,269
	C49B	214	0	0	26	134	0	373
	C49B.0001	194	3	0	0	42	0	240
Goose Creek	C49B.1000,.1100,.1200	839	132	379	297	23	579	2,248
Control Creek	C49B.2000,.2400,.2500.,2600	1,761	521	676	410	148	682	4,198
Rio Beaver	C49B.2100	636	220	442	30	60	478	1,866
Rio Roberts	C49B.2200	911	489	254	47	112	54	1,867
Upper Thorne River	C49B.2300	1,254	282	572	430	72	306	2,916
East Goose Creek	C70A	0	3	2	0	0	0	4
Paul Young Creek	C72A	18	4	2	0	0	0	24
Anderson Creek	C73C	11	0	8	11	0	2	32
	C74B	0	0	0	0	0	0	0
Black Bear Creek	C93A	0	0	115	0	0	204	319
Steelhead Creek	C95B	851	691	1,416	39	272	932	4,202
Election Creek	C96A	158	165	421	12	21	306	1,083
Staney Creek	C97C, C99C,B59C	7	4	7	0	0	13	31
	D01B	3	0	0	0	0	0	3
Shinaku Creek	D03B	170	438	581	91	0	556	1,836
103-60-25	D04A	0	0	24	0	0	41	65
103-60-07	D07A	0	0	1	0	0	0	1
103-60-05	D08A	742	381	485	50	13	139	1,864
Elevenmile Creek	D09A	383	264	53	48	0	33	781
Goodrow Creek	D10A	135	11	39	0	0	6	192
	D11A	7	0	5	0	0	0	12
Nossuk River	D12A	589	251	245	0	0	98	968
103-80-44	D13A	23	5	73	0	0	0	101
103-80-46	D14A	74	20	80	0	0	18	192
103-80-50	D15A	148	164	45	16	18	57	448
James Creek	D16A	44	130	18	0	7	0	199
Total Project Area		12,745	5,531	6,501	2,816	1,037	5,221	33,852

Source: USDA Forest Service Ketchikan Area, database.

[1/] Unlisted watersheds do not have subject criteria.

Table 3-5
Previously Harvested Project Area Riparian Management Area (acres)[1/]

Name	Watershed	Class I Stream	Class II Stream	Class III Stream	Lake	Riparian Soils	MMI4	Totals
	000Z	6	2	0	0	0	0	8
	BS7A	0	2	0	0	0	0	2
	BS8A	7	0	0	0	0	0	7
103-80-37	BT2A	6	3	5	0	0	0	14
Hatchery Creek	C20D	0	0	8	0	0	5	13
Logjam Creek	C21C	42	34	7	2	2	0	87
North Thorne River	C45D,C49B,2700	49	5	1	1	0	0	56
	C49B	0	0	0	1	1	0	2
	C49B.0001	62	0	0	0	11	0	73
Goose Creek	C49B.1000,.1100,.1200	28	6	64	12	3	16	129
Control Creek	C49B.2000,.2400, .2500,.2600	17	24	8	1	0	53	103
Rio Beaver	C49B.2100	230	83	176	12	14	49	564
Rio Roberts	C49B.2200	0	1	3	0	0	0	4
Upper Thorne River	C49B.2300	19	0	13	0	0	0	32
East Goose River	C70A	0	3	0	0	0	0	3
Steelhead Creek	C95B	65	32	126	1	16	0	240
Election Creek	C96A	7	23	54	0	0	6	90
Staney Creek	C97C,C99C,B59C	0	0	0	0	0	0	0
Nossuk River	D12A	31	41	18	0	0	0	90
103-80-44	D13A	1	0	0	0	0	0	1
103-80-50	D15A	0	0	0	0	3	0	3
Total Project Area		571	259	483	30	50	129	1,521

Source: USDA Forest Service Ketchikan Area, database.

1/ Unlisted watersheds do not have subject criteria.

This page left intentionally blank

Water, Fish, and Fisheries

Key Terms

Adfluvial—fish that ascend from freshwater lakes to breed in streams.
Alevin—newly hatched salmon that are still attached to the yolk sac.
Alluvial fan channel—a fan-shaped deposit of sand, gravel, and fine material made by a stream where it runs out onto a level plain or meets a slower stream.
Anadromous—fish that ascend from the sea to breed in freshwater streams.
Aquatic Habitat Management Unit (AHMU)—areas for managing the resources associated with streams and lakes.
Bedload—sand, silt and gravel, or soil and rock debris rolled along the bottom of a stream by moving water.
Best Management Practices (BMPs)—land management methods, measures or practices intended to minimize or reduce water pollution.
Biotic—living.
Channel types—the defining of stream sections based on watershed runoff, landform relief, and geology.
Estuary—relatively flat, intertidal, and upland areas where saltwater meets fresh water, as at the heads of bays and the mouths of streams.
Large woody debris (LWD)—any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than one meter that intrudes into a stream channel; also called Large Organic Debris (LOD).
Management Indicator Species (MIS)—species whose population changes are believed to best indicate the effects of land management activities; fish MIS for the Control Lake EIS are coho and pink salmon and Dolly Varden char.
Mitigation—measures designed to counteract environmental impacts or to make impacts less severe.
NTU—nephelometric turbidity units, a unit of measurement based on the amount of light transmitted through water.
Resident fish—non-migratory fish that complete their entire life cycle in fresh water.
Salmonid—refers to the group of fish to which salmon belong.
Sediment—water-transported earth materials (e.g., gravel, sand, silt).
Smolt—a juvenile salmon, trout, or Dolly Varden migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.
Solute—substance dissolved in a solution.
Stream flow regime—the characteristic discharge of water from a watershed that occurs in the natural stream channel.
Stream order—the designations (first, second, third, etc., stream order) is of the relative positions of stream segments in a drainage basin network with the smallest, unbranched, intermittent tributaries terminating in an outer point designated as first order streams; the junction of two first order stream segments produces a second order stream segment; the junction of two second order stream segments produces a third order stream segment, etc.
Third order watershed—a watershed that contains a third order stream segment.
Turbidity—an indicator of the amount of sediment suspended in water.
V-notch—a deeply incised, narrow valley along a drainage with a characteristic "V" shaped cross-section.
Watershed—area that contributes runoff water to a waterway.

3 Affected Environment

Introduction

The water resources of the Control Lake Project Area comprise interacting physical and biological components. Watersheds form the fundamental landscape units, collecting precipitation and delivering water, sediments, and nutrients to streams. The physical components of watersheds include climate and precipitation, soil, hillslopes, streams, wetlands, and riparian areas including floodplains. Biological factors important to Project Area watersheds include forest and plant processes, riparian vegetation that directly affects fishery habitat along streams, and human activity that modifies the physical and biological makeup of the watershed. The biological processes affect soil development and stability within the terrestrial environment, while adding nutrients and structural elements to the aquatic environment. Physical processes and human activities within watersheds affect aquatic life by influencing the quantity, quality, and rate of water and sediment delivery in streams.

This section deals with the water resources and aquatic life aspects of watersheds. The *Soils and Wetlands, Floodplains, and Riparian Areas* sections discuss several other watershed features.

The Project Area includes all or part of approximately 42 major watersheds (see Figure 3-3), 29 of which contain anadromous fish streams according to the ADF&G. The Thorne River-Hatchery Creek complex drains the eastern portion of the Project Area and is collectively known as the Honker Divide. The Thorne River, which exits the Project Area at Thorne Bay, contains many tributaries including the North Thorne River, and Rio Roberts, Rio Beaver, Cutthroat, and Control Lake creeks. Hatchery and Log-Jam creeks drain out of the Project Area to the northwest. Many small creeks and a few large streams drain south to Big Salt Lake in the western Project Area. These include Steelhead, Black Bear, Election, and Shinaku creeks, among others. Western and southern drainages from the low-relief Western Peninsula include Elevenmile, Goodrow, and James creeks, the Nossuk River, and numerous unnamed streams that flow into the waters of the San Christoval Channel, Salt Lake Bay, and Nossuk Bay.

The Project Area contains many hydrologic and aquatic resources. These include numerous small ponds, small- to medium-sized lakes, and large and small streams that directly or indirectly influence abundant and important fisheries resources.

Water Resources

A variety of freshwater resources in addition to fisheries are present in the Control Lake Project Area. These resources are described below under the categories of hydrology, water quality, and consumptive water uses.

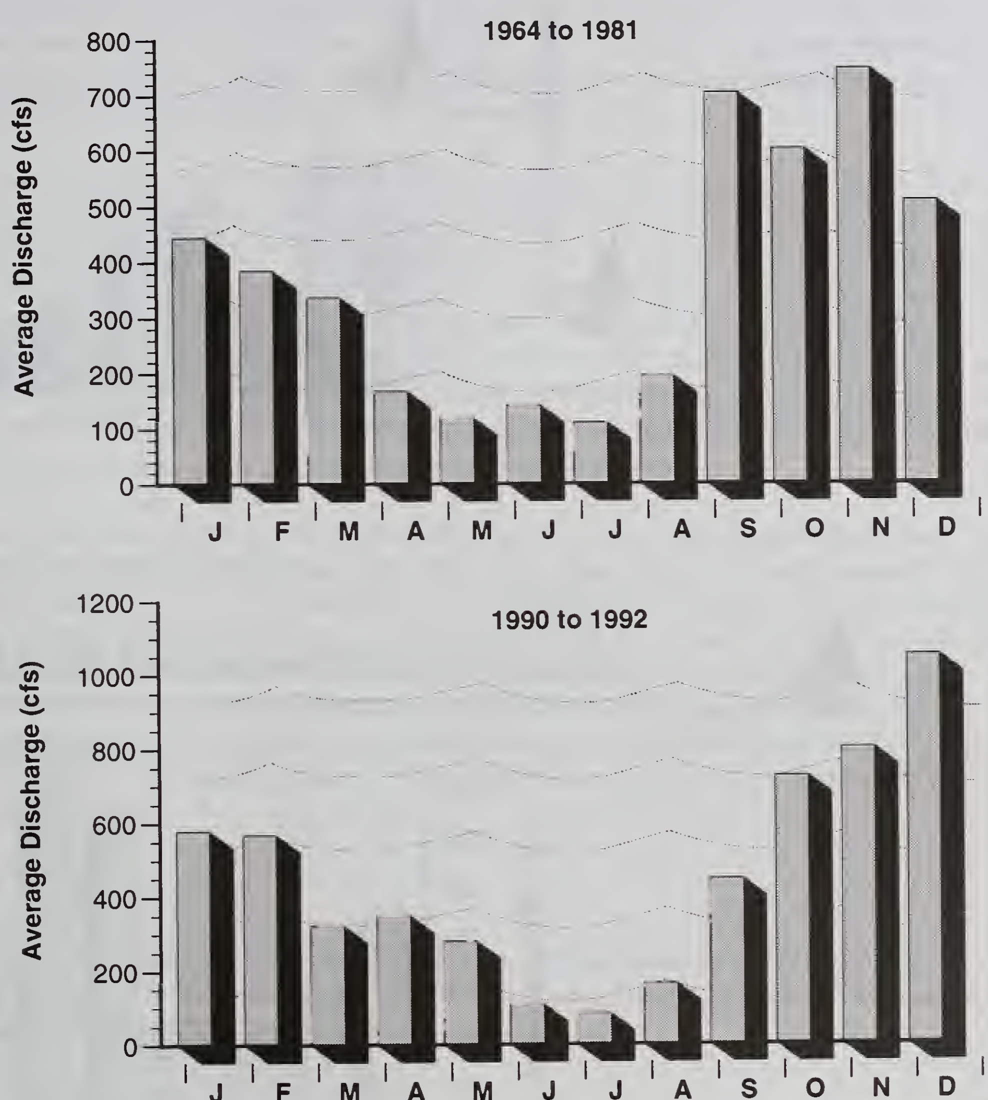
Hydrology

Gauges to measure stream discharge have been placed in only a few streams on Prince of Wales Island. Only the record at Black Bear Lake (USGS, 1980 to 1991) in the Project Area is long enough to be reliable. Intermittent measuring occurred on Staney Creek (USGS, 1964 to 1981, 1990 to 1992) and North Fork Staney Creek (USGS, 1991 to 1992) immediately west of the Project Area. These three watersheds vary in elevation from near sea level to 1,700 feet; thus, the effect of snow and snow melt on stream flow can be inferred.

From 1964 to 1981, the average monthly discharge for Staney Creek (measured at 2 feet above sea level) was 367 cubic feet per second (cfs). Stream flow generally appears to be dictated by seasonal precipitation variations, with highest average monthly discharge in the fall and winter months (Figure 3-6). Discharge measuring at Staney Creek resumed in 1990 slightly upstream from the original site of the gauge (elevation 47 feet).

Figure 3-6

Average Monthly Discharge of Staney Creek 1964 to 1981 and 1990 to 1992.



The mean monthly discharge for the North Fork Staney Creek is 227 cfs for 1991 and 1992 measured at elevation 600 feet. The highest average monthly stream flows occur in the fall and winter with lowest flow in July (Figure 3-7). A secondary peak appears in April and May. Again, stream flow correlates with seasonal precipitation trends. The April to May stream flow peak may be related to storms during this period or to storage of winter snow precipitation above the 600-foot elevation and snow melt release in spring.

Figure 3-8 shows the average monthly discharge for Black Bear Lake for 1981 to 1991 (elevation 1,700 feet). The mean annual discharge was 28.3 cfs. Early fall discharge is influenced by seasonal precipitation. Late spring maximums and winter minimums are due to snow storage in the fall and winter and snow melt for this small, high-elevation watershed.

Figure 3-7

Average Monthly Discharge of North Fork Staney Creek

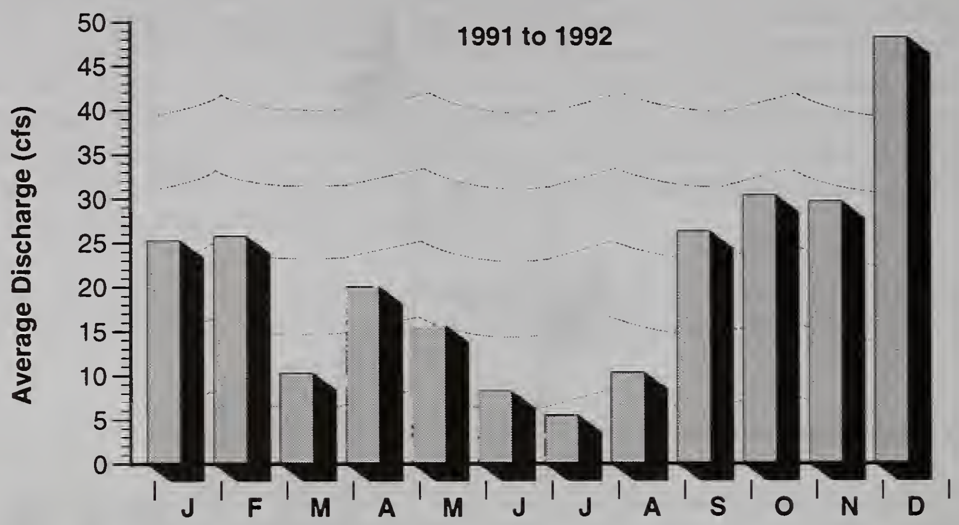
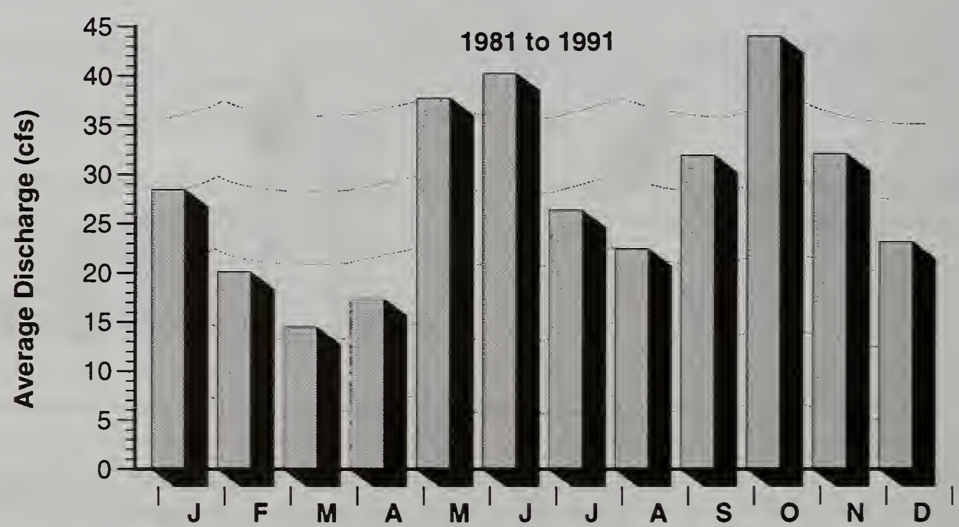


Figure 3-8

Average Monthly Discharge of Black Bear Lake



The elevation-snow relationship was not apparent in larger streams (Staney Creek). This indicates that precipitation trends dominate stream flow and the impact of spring snow melt on discharge in large, low-elevation watersheds is small. Schmiege et al. (1974) report that the Harris River, with a large proportion of its watershed in the higher elevations of Prince of Wales Island, has two high-flow periods and two low-flow periods. This would indicate that winter storage and spring snow melt is significant in large, high elevation watersheds. This seasonal distribution is likely to occur on individual streams such as Cutthroat Creek, Rio Beaver, Rio Roberts, and Goose Creek which drain highland areas. The influence of snowmelt on these individual streams on the Thorne River is likely dampened somewhat because flow from other lowland areas and extensive lake systems slow water travel time.

Land-use activities such as logging and road development also influence watersheds. Various studies show that in many instances total stream flow following rainfall and snowmelt increases when logging and road-building has occurred (Harr and McCorison, 1979; Harr et al., 1982). Low flows during dry summer months decreased following logging in one study because of a reduction in fog interception and drip after logging. These studies also demonstrate the complex interacting processes that makes predicting specific watershed responses to land-use activities difficult. The size of watersheds (roughly analogous to the order of drainage basin) and amount of activity (percent harvested and extent of road building) influences the hydrologic response.

Because of the steep slopes in the Project Area, the soil's high water transmissivity, and generally high initial moisture conditions, both small stream and river runoff generally respond quickly to rainfall events. For example, James (1956) reports that within 16 hours of a 1.25-inch rainstorm, Maybeso Creek, south of the Project Area, rose from 0.8 to 2.6 feet. Maybeso Creek, the Harris River, and Indian Creek react to precipitation almost identically (James, 1956). Base flow for these drainages is slightly different. Base flow for Maybeso Creek decreases from about 35 cfs after 10 days without rain to 13 cfs after 30 rainless days. The values for the Harris River and Indian Creek for equivalent periods are 64 and 26 cfs, and 5 and 3 cfs, respectively.

Water Quality

Sediment, water chemistry, and water temperature, all discussed below, influence water quality. Human land use activity can alter these factors. Water quality affects water use by humans, fish, and all other organisms.

Stream Sediment

Sediment is water-transported materials such as gravel, sand, and silt. Gravel and sand generally move along the stream bottom as bedload. Silt is generally transported in a suspended state and causes water to appear murky or turbid. Suspended sediment transport is limited by the availability of fine-grained material.

The *Soils* section discusses the sources of stream sediment. Fine sediment (0.1 to 4.0 mm in diameter) can reduce stream habitat quality, restrict sunlight penetration, and fill pores between gravel preventing the flow of oxygen-rich water to fish eggs. The Alaska Water Quality Standards for growth and propagation of fish, shellfish, and other aquatic life, and wildlife require that turbidity shall not exceed 25 nephelometric turbidity units (NTU) above natural levels. The standards also state that the percent of fine sediment in the gravel of anadromous or resident fish spawning waters may not be increased more than 5 percent by weight over natural conditions. In no case may that sediment range exceed a maximum of 30 percent by weight.

Data in NTU's do not exist for the Project Area, but Meehan et al. (1969) report ranges of suspended sediment for nearby Maybeso Creek of 0.0 to 148.7 ppm; Harris River, 0.0 to 46.6 ppm; and Indian Creek, 0.0 to 57.6 ppm. NTU values relate directly to parts per million of sediment; however, conversion requires that the relationship be established on a watershed-by-watershed basis (Beschta, 1980; Lloyd et al., 1987). The study of Maybeso Creek by Meehan et al. (1969) reports no statistically significant changes in suspended sediment mean or regression values before and after logging.

Reports exist on the grain size distribution of coarse stream bed sediments near the Project Area (McNeil and Ahnell, 1964; Sheridan and McNeil, 1968; and Sheridan et al., 1984). For the Harris River and Twelvemile Creek, Sheridan et al. (1984) report mean values of less than 0.83 mm sediment between 4.8 and 5.4 percent. For the Harris River, Sheridan and McNeil (1968) report mean values of less than 0.83 mm sediment between 13.9 and 14.2 percent for 1959 pre-logging samples. McNeil and Ahnell (1964) report 1959 pre-logging grain size distributions for the size range between 0.1 to 4.0 mm as 54 and 43 percent by volume for the Harris River and Twelvemile Creek, respectively. For Staney Creek, Sheridan et al. (1984) report that sediment less than 0.83 mm has mean values ranging from 7.4 to 11.0 percent before and during logging operations.

Water Chemistry

Water chemistry influences all aquatic life by providing needed nutrients and trace elements. The addition of human-made chemicals such as fertilizers used in erosion control along roads or petroleum products from vehicles or storage areas can affect water quality. Numerous samples taken throughout the entire Forest Service Ketchikan Area show that streams meet water quality standards (USDA Forest Service, 1989a). No water quality data for the Project Area exists; however, in the Polk Inlet Area to the south, laboratory measurements of pH, dissolved solids, conductivity, and chemical constituents of the streams also fall within Alaska State Water Quality Standards (Stewart and Baker, 1993).

Stream Temperature

Stream temperatures are important in regulating biologic productivity in the aquatic environment. Alaska Water Quality Standards establish upper range temperature limits of between 55.4 and 59°F for growth and propagation of fish, shellfish, and other aquatic life and wildlife. Temperature shall not exceed 68°F at any time. Stream temperatures recorded in the summer of 1993 by Project field personnel within or near potential harvest units were from 42.8 to 65.3°F (Table 3-6). The temperature data collected during the field season averaged 55.4°F, 51.6°F, and 49.1°F for Class I, II, and III/IV streams, respectively. Including lake data increased the average Class I temperatures to 56.7°F. Individual lake temperature measurements exceeded water quality standards. These lake temperatures were taken in the shallow nearshore area where temperatures are highest. The sampling periods included a range of weather and cloud conditions during an atypical dry and warm summer. This is in contrast to the historical measurements in Maybeso Creek shortly after the removal of 25 percent of the watershed forest and clearcutting to stream bank in the 1950s. During that period, temperatures were frequently greater than 60°F, resulting in average and peak summer temperatures significantly higher, probably as a result of the harvest methods used at that time (Meehan et al., 1969).

Table 3-6
Stream Temperatures in the Control Lake Project Area

Stream Class	Temperature (°F) Maximum	Minimum	Average	Number of Observations
Class I	65.3	46.4	55.4	77
Class II	61.7	46.4	51.6	48
Class III/IV	55.4	42.8	49.1	57
Class I including lakes	71.6	46.4	56.7	87

SOURCE: Rogers and Ablow, 1995.

Consumptive Uses

Key consumptive water uses within the Project Area are minor, but include development and recreational water supply. There are no Federally designated municipal watersheds within the Project Area. There is recreational water use on Federal land at Forest Service cabins at Control Lake, Black Bear Lake, and Lake Galea in the Honker Divide. These sites have no developed water supply and users must treat local surface water. The water supply for campers at Eagle's Nest Campground is hauled in by truck from Thorne Bay. Water use from streams and lakes occurs at the numerous dispersed recreational sites in the Project Area. These sites are discussed in the *Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas* sections.

The Alaska Water Quality Standards (19 AAC 70) that apply to the Project Area are those for the propagation of fish, shellfish, and other aquatic life, and for wildlife. The Water Quality section above summarizes the appropriate parameters. Standards for water supply are more stringent than those for fish and wildlife. Values for turbidity shall not exceed 5 NTU above natural conditions when the natural turbidity is 50 NTU or less; there should not be more than a 10 percent increase in turbidity when the natural condition is more than 50 NTU; and values are not to exceed a maximum increase of 25 NTU. Water temperatures shall not exceed 59°F.

Fish and Fisheries Resources

Fish and aquatic resources in the Control Lake Project Area help support subsistence use and commercial and sport fisheries. These resources are important to the economy and lifestyles of area residents and visitors (see the *Subsistence* and *Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas* sections).

Project Area streams contain important anadromous and resident fish habitats. The streams support four species of anadromous salmon (pink, chum, coho, and sockeye) as well as resident kokanee, cutthroat trout, rainbow/steelhead trout, and Dolly Varden char. King salmon are found in the inlets and bays of the Project Area, but do not spawn in its streams. These species are important to the commercial, recreational, charter boat/lodge, and subsistence fishery of the region. These fish also are a major food resource for black bears, river otters, eagles, and other wildlife. Other nongame species, including sculpin, sticklebacks, and smelt, are also present in the Project Area's streams and waters (Taylor, 1979).

Anadromous fish spend part of their life in fresh water and part in salt water. Salmon lay their eggs in stream gravels, and the juvenile fish hatched from the eggs emerge from the gravels (Figure 3-9). The amount of time the juveniles spend in fresh water depends on the species of

salmon. Pink salmon start their downstream migration immediately after emergence, while coho salmon juveniles generally spend two years in fresh water before migrating to the ocean. Pink and chum salmon depend heavily on estuaries during their early life stages. Salmon reach maturity in the ocean, returning to their natal streams to spawn and die and start the cycle again. Steelhead trout follow a cycle similar to coho salmon, except they often survive the spawning season, return to the ocean, and spawn again. Resident trout, char, and kokanee spend all of their lives in fresh water, spawning in stream gravels and growing to maturity in the streams and lakes of the area.

Estuaries are important aquatic resource areas; they form transitions between terrestrial, freshwater, and marine environments. Estuaries are rich and diverse, harboring many resident species and providing food, spawning areas, or shelter for numerous other species including anadromous salmon and trout at critical points in their life cycle (USDA Forest Service, 1985). In the Control Lake Project Area, estuaries and the surrounding waters contain crab, shrimp, clams, mussels, and various marine fishes. These regions are important as nursery areas for the young of these marine species. Herring and smelt also use these areas for spawning and feeding.

Major Project Area estuaries are found primarily at the heads of bays and inlets where major streams enter. Smaller estuaries are present at most stream mouth regions. All the estuaries found in the Project Area are located on Big Salt Lake and along the Western Peninsula.

The Project Area contains several fisheries enhancement projects. These projects include an adult fish passage facility around natural barriers on Rio Roberts Creek and habitat enhancement, including the addition of large woody debris structures, in Control Lake. Future basinwide habitat enhancements are planned for the Rio Beaver watershed including control of sediment erosion into streams, riparian vegetation planting, and culvert maintenance.

The installation of a fish pass facility at Rio Roberts Creek offers anadromous fish access to upstream habitat. The ADF&G planted cultured native Thorne River coho fingerlings above the fish pass in 4 consecutive years to seed the habitat. Recent data collected by the Thorne Bay Ranger District shows that production is now occurring above the fish pass.

Stream Classification

The 1997 TLMP further subdivided Class III streams into Class III and CLass IV streams. See the Glossary for the current definitions.

Stream classes are used to categorize stream channels based on their fish production values. The Forest Service uses three stream classes for the Tongass National Forest. Class I streams have anadromous or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream fish habitat. Class I streams also include the habitat upstream from migration barriers known to provide reasonable enhancement opportunities for anadromous fish and habitat with high-value resident sport fish populations. Class II streams have resident fish populations and generally steep (often 6 to 15 percent) gradients. They also can include streams from 0 to 5 percent gradient where no anadromous fish occur. Fish populations in Class II streams have limited sport fisheries values. Class II streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use. Class III streams have no fish populations, but influence water quality at downstream aquatic habitats. Some steep gradient Class III streams run directly into salt water and have no fish habitat influence. Table 3-7 shows the total mileage of Class I, II, and III streams in the Project Area by watershed.

Figure 3-9
Salmon Life Cycle

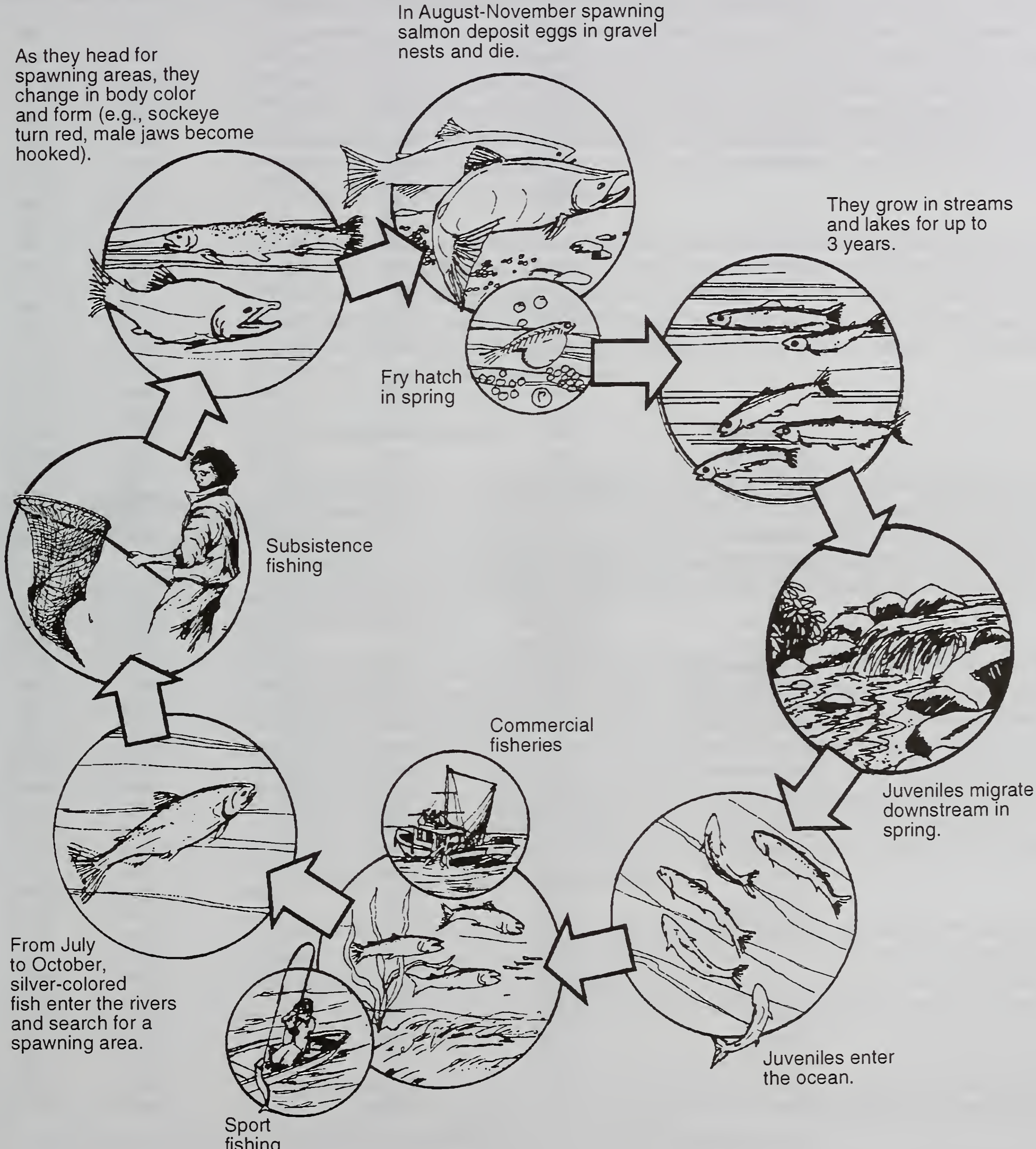


Table 3-7

Project Area Streams by Class (in miles)

Name	Watershed	Class I	Class II	Class III	Total
	000Z	1.80	0.89	1.51	4.20
	BS7A	0.17	0.12	0.00	0.29
	BS8A	0.76	0.00	0.00	0.76
	BT1A	0.12	0.00	0.00	0.12
103-80-37	BT2A	1.12	1.43	2.65	5.21
103-60-03	BT6A	0.22	0.00	0.00	0.22
103-60-01	BT7A	0.32	0.00	0.00	0.32
	BT8A	0.23	0.40	0.14	0.77
	BT9A	0.00	0.37	0.43	0.80
103-70-03	BW1A	0.57	1.55	1.16	3.27
103-80-56	BW2A	0.68	1.32	0.08	2.08
103-80-53	BW3A	0.26	0.13	0.35	0.75
	BW4A	0.08	0.00	0.11	0.19
	BW5A	1.01	0.30	1.65	2.96
	BW6A	0.59	0.20	0.21	0.99
	BW7A	0.61	0.00	0.00	0.61
	BW8A	0.23	0.00	0.00	0.23
	BW9A	0.72	0.00	0.00	0.72
	BX1A	0.93	0.20	0.00	1.13
Hatchery Creek	C20D	40.64	19.33	28.90	88.88
Logjam Creek	21C	52.54	20.05	31.64	104.22
North Thorne River	C45D,C49B,2700	29.79	0.99	3.42	34.19
Thorne River	C49B,C45D,	226.42	61.15	208.74	496.32
	C49B	5.95	0.00	0.00	5.95
C49B.0001	6.35	0.15	0.02	6.52	
Goose Creek	C49B.1000,.1100				
Control Creek	C49B.2000,.2400,				
	.2500,.2600	60.42	18.95	61.46	140.83
Rio Beaver	C49B.2100	17.76	7.90	39.01	64.67
Rio Roberts	C49B.2200	27.67	18.10	23.12	68.89
Upper Thorne River	C49B.2300	47.60	10.29	49.67	107.55
East Goose Creek	C70A	0.00	0.07	0.13	0.21
Paul Young Creek	C72A	0.54	0.09	0.14	0.78
Anderson Creek	C73C	0.45	0.00	0.82	1.27
Black Bear Creek	C93A	0.00	0.00	9.61	9.61
Steelhead Creek	C95B	30.57	27.20	130.08	187.85
Election Creek	C96A	4.53	6.35	37.00	47.88
Staney Creek	C97C,C99C,B59C	0.26	0.12	0.62	1.00
Shinaku Creek	D03B	6.91	15.77	52.51	75.19
103-60-25	D04A	0.00	0.00	1.91	1.91
103-60-07	D07A	0.00	0.00	0.05	0.05
103-60-05	D08A	21.35	14.59	19.87	55.80
Elevenmile Creek	D09A	11.51	7.10	4.74	23.35
Goodrow Creek	D10A	3.39	0.39	3.96	7.74
	D11A	0.21	0.00	0.44	0.66
	D12A.0001	3.61	3.82	1.99	9.41
Nossuk River	D12A	13.26	5.47	22.40	41.13
103-80-44	D13A	0.68	0.17	6.46	7.32
103-80-46	D14A	2.08	0.75	7.23	10.05
103-80-50	D15A	4.22	6.09	4.07	14.38
James Creek	D16A	1.19	4.72	1.51	7.42
TOTAL		434.84	200.13	584.84	1,219.82

SOURCE: Forest Service, Ketchikan Area, GIS database.

The Forest Service classified streams in the Control Lake Project Area based on available field data and map assessment. Where field data were not available, stream classifications were based primarily on the evaluation of maps and aerial photographs; channel types are based on definitions in USDA Forest Service (1987). The channel type definition for the Tongass National Forest is an inventory and planning tool that stratifies stream and lake sections within a watershed into different stream process groups. The process groups are based on physical characteristics of streams and predict their physical response to different management activities. The Channel Type User Guide, Tongass National Forest, Southeast Alaska (USDA Forest Service, 1992b) contains the most recent description of stream process groups and channel type. Based on channel-type definitions and other available data, the Project Team assigned an appropriate class to each stream and entered the data into the GIS stream data file. Stream class and channel type help establish prescribed riparian buffer widths (see the *Wetlands, Floodplains, and Riparian Areas* section).

The Project Team field-verified stream classes and channel types during harvest unit investigations. The Team identified all stream classes and channel types during site visits and noted this information on field unit cards for later transfer to the GIS. They then used this field data, along with aerial photos and maps, to modify the GIS stream layer. This update added considerable miles of stream to the GIS layer for the Control Lake Project Area. Table 3-7 presents stream miles based upon the updated GIS layer.

Fish Habitat Capability

Maintaining or improving habitat capability to produce salmon is a primary management goal of the Forest Service. Although the Forest Service does not have jurisdiction over escapement, it is concerned about maintaining escapement of sufficiently high numbers of adult salmon spawners to seed the available habitat. Adult spawner escapements depend on numerous factors, such as commercial harvest rates and ocean survival, that are not influenced by changes in upland management.

Upland timber management potentially affects fish production. The Forest Service modeled fish production for the Project Area (USDA Forest Service, 1989b). The number of fish that a particular habitat potentially can produce is called habitat capability. Habitat capability for species harvested for subsistence, sport, and commercial purposes is very important since these species contribute to the livelihood and economic returns to the region. The fishing industry provides both jobs and income for Southeast Alaska (see the *Economic and Social Environment* section). Fishing, especially for salmon, also is a source of subsistence for residents of Prince of Wales Island. Additionally, salmon (particularly coho) and trout (particularly steelhead and cutthroat) are important to recreational anglers.

Several factors affect fish production or habitat capability within the stream environment. Logging practices can affect many of these important factors. A by-product of logging practices is increased vehicular access to fishing via logging roads. As a result, increased fishing pressure is placed on these river and creek systems. Resident nonmigratory fish, such as cutthroat trout, could be affected by overfishing.

The following is a brief summary of the importance of some of the major environmental factors that can affect the production of fish within the systems. The discussion also presents general Forest Service guidelines to reduce effects of harvest activity.

Sedimentation

The concentration of sediment in the water column and the amount of fine sediment introduced into spawning gravel can affect aquatic productivity. Direct effects include clogging and damage to gill filaments and changes in fish behavior or habitat use (Marcus et al., 1990). Fine sediment introduced into stream gravels during incubation can entrap and kill salmonid embryos in the redd. Sediment deposition decreases redd permeability, which limits both the amount of water flow within the gravel and oxygen delivery to developing eggs and newly emerging fry (alevins) (Marcus et al., 1990; Everest et al., 1985), threatening their survival. Even if sediment deposition is not fatal to developing alevins, it can reduce their growth and fitness (Everest et al., 1985).

Regulations exist to eliminate or reduce the adverse effects of sediment-producing activity associated with logging. These include limiting road construction activities and use of equipment in Class I streams to those periods when eggs or alevins are not in the stream gravels. The windows for such activities generally occur before adult salmon enter streams to avoid disturbance during spawning. These windows can vary from stream to stream and site to site. Site-specific fisheries and field information (including ADF&G recommendations) help determine the operating windows. In the Ketchikan Administrative Area, the windows for allowed instream operations are from June 1 to August 7 for pink and chum salmon, June 15 to September 1 for coho salmon, and July 18 through August 15 for steelhead trout. Because of the variety of fish, their abundance, and timing by system, the exact dates of allowable construction may vary from those presented.

Indirect effects of fine sediment include embedding of gravels and filling of pools, both of which decrease the amount of available instream habitat for salmonids. Fine sediment fills cobble and gravel interstices, which serve as refugia for both juvenile and adult salmonids during the winter. The sediment accumulation might also reduce the volume of pools. Pools are important habitat for salmonids and other fishes during the winter. Lack of suitable winter habitat probably limits production of juvenile salmonids in many Alaskan streams (Marcus et al., 1990; Heifetz et al., 1986).

The effects of fine sediment on aquatic systems are highly variable and depend on the amount added, the amount already present, and the system's ability to store and transport sediment. A general review of studies on the effects of fine sediment on salmonid production (Everest et al., 1987) found that the assessments ranged from inconclusive to severe. In a similar review, Pella and Myren (1974) concluded that studies on streams near Hollis in southcentral Prince of Wales Island failed to reveal a meaningful relationship between clearcut logging to streambank and subsequent pink and chum salmon escapements. The studies were inconclusive, however, because of changes in salmon harvest rates, high natural variability in salmon escapements, and the short timeframe of the studies, among other factors.

The nutrient content of the water, type of debris, low pool-riffle ratio, and embeddedness of cobble/bedrock all limit fish productivity. Maintaining woody riparian vegetation is important as a source of nutrient input and as a source of debris to create pools and trap sediment in the stream.

Stream Temperature and Dissolved Oxygen

Seasonal changes in water temperatures and low levels of dissolved oxygen influence fish survival and condition. Water temperature affects the metabolic rate of aquatic organisms and can influence the migration timing of adult and juvenile fish. When temperatures go up, dissolved oxygen levels fall.

Small changes in water temperature can affect incubation and development of eggs in stream gravels as well as the emergence, feeding, and growth of fry and juvenile fish. Temperature change has a great effect on eventual adult survival (Holtby and Scrivener, 1989). Streamside forest or riparian vegetation provides overstory cover that maintains water temperature on small forested streams (Beschta and Platts, 1986). Harvest of riparian vegetation, as well as the total amount of harvest in a watershed, therefore, can affect water temperature.

Low winter temperatures can cause anchor ice to form and spawning gravels to freeze, which can reduce pool size. Removing streamside vegetation can aggravate low temperatures. However, estimating the effects of such cold-weather conditions is difficult because of the influences of intermittent snow or ice cover, high variability in winter air temperature, and the wind and precipitation patterns commonly found in Southeast Alaska. The implementation of TTRA and expanded-width buffers for riparian areas may moderate temperatures year-round (Marcus et al., 1990).

Dissolved oxygen levels in streams also affects survival of fish. Low concentrations that occur when fish abundance and water temperature are high can reduce fish survival. Stream systems that are particularly sensitive to high temperatures include slow-flowing streams with southerly aspects and streams with shallow lake and muskeg sources.

Fish kills, probably caused by high temperature or low dissolved oxygen, have occurred in and near the Project Area during periods with high air temperatures and low flows. The most recent was in September 1993 (USDA Forest Service, 1993b). Forest Service and ADF&G fish biologists assessed the extent and severity of fish kills across central and northern Prince of Wales Island using aerial observations (USDA Forest Service, 1993b). The surveys were not quantitative. Dead and dying fish were present in all of the drainages observed. The percentage of unspawned dead fish varied by drainage. The majority were pink salmon; there also was a fairly high number of chum salmon. When dead fish were observed, they occurred in very large numbers and very high densities.

Precipitation and streamflow were extremely low in this area in 1993, greatly reducing total fish-holding habitat and probably increasing average stream temperature (USDA Forest Service, 1993a). Lethal water-temperature limits for both adult and salmon fry is 75.2°F; ideal temperatures generally are between 50°F and 64.4°F. None of the water temperatures were high enough to be considered lethal by themselves. The highest temperature recorded during the survey was on Staney Creek (60.8°F) (USDA Forest Service, 1993a, 1993b). However elevated water temperatures contribute to the problem since warmer water holds less oxygen than cooler water. Extensive timber harvest practices affect flow regimes and stream temperatures by altering hydrologic and riparian conditions. However, the extent to which previous logging activity contribute to fish kills is not known.

Below is a brief summary of fish kills and habitat conditions observed during the September 1993 aerial survey (USDA Forest Service, 1993b.)

Thorne River—Large concentrations of fish (estimated 300) were observed in the lower Thorne River from the estuary to Goose Creek. Mostly live and few dead fish were observed from Goose Creek up to 8.5-mile hole. The riparian zone of the lower Thorne River consists of a mixture of old- and second-growth forest. Upstream riparian areas (including tributaries) have been heavily to moderately harvested.

Steelhead Creek—Thousands of dead fish were observed in lower Steelhead Creek from the estuary to above the 20 Road. Thousands of live fish were also present in the system. Most of the riparian area was harvested 10 to 12 years ago. Approximately 1,000 feet of old growth

extends from the harvested reach to just below a barrier falls. There are moderate levels of harvest in and around the riparian area above the falls. Fish mortality extended to near the base of the barrier falls.

Election Creek—Several hundred dead fish were observed in the lower reaches of Election Creek on private land, but mortality appeared to be fairly low in the middle and upper reaches of Election Creek on National Forest System land. Moderate to high concentrations of live fish were observed in the lower, middle, and upper reaches. Most of the riparian area of lower Election Creek was harvested approximately 10 years ago. There has been little riparian harvest in the middle and upper reaches which are mostly well buffered.

Nossuk Creek—Several thousand dead salmon were distributed evenly from the lower to upper reaches of Nossuk Creek. A substantial number of fish were still in the estuary waiting to enter the stream. Observers could not determine the species composition of these fish. From ground observation in the upper reach of Nossuk Creek, an estimated 70 percent of the dead fish, many of which were chum salmon, had completed spawning. This reach had many successfully spawning pink salmon. The majority of the Nossuk Creek riparian area is old growth.

Staney Creek—Though most of the Staney Creek watershed is not in the Project Area, it is in close proximity. Thousands of dead fish were observed in the upper reaches of the middle fork of the creek above the confluence of the middle and south forks. The greatest concentration of dead fish (90 percent of all fish in the reach) were observed in the reach extending from the confluence of the middle and south forks down to the 2050 bridge crossing. The Forest Service examined a representative reach with extremely high mortality. The reach was mostly a nearly dewatered riffle. In one 50-foot length of stream, 586 dead salmon were counted. An estimated 90 percent of the salmon had not spawned. Dead sculpins and Dolly Varden were also present. The temperature was approximately 60.8°F. Although the total number of dead fish was high, the proportion of dead to live fish was lower, about 75 percent from the 2050 bridge to the estuary. The majority of the Staney Creek riparian area was logged approximately 20 to 25 years ago. The ground observations were made in an area logged during this period.

The specific cause of the fish kills described above is unknown. Fish kills in other parts of Southeast Alaska have been linked to overcrowding of spawning fish in high escapement years resulting in de-oxygenation of water from fish respiration. Such events are unpredictable and have not been directly linked to timber harvest. Research has been conducted on the potential causes of these fish kills (Pentec Environmental, Inc., 1991). The research was designed to address the physical instream reasons for adult fish kills. No actual fish kills were observed during this phase of the research (Pentec Environmental, Inc., 1991).

Large Woody Debris

Large woody debris (LWD) are trees and tree pieces greater than 4 inches in diameter and 6 feet long (Keller and Swanson, 1979; Bilby and Ward, 1989). LWD are critical to high-quality fish habitat (Marcus et al., 1990). Also known as large organic debris (LOD), this material provides food and building materials for many aquatic life forms, offers cover for juvenile and adult fish, and is the primary channel-forming element in some channel types (Marcus et al., 1990). If trees are harvested to the stream bank, it can take as long as 90 to 150 years for new trees to grow to the size needed for effective LWD input into the stream. Prior to the enactment of TTRA, timber often was harvested to the edge of the streams. Stream-cleaning operations were commonly conducted to prevent fish passage problems. TTRA and its expanded-width buffers offers a source of LWD.

LWD affects many aspects of streams, including channel morphology, sediment storage, water retention, stream nutrient cycling, macroinvertebrate productivity, and fish habitat (Marcus et al., 1990; Lisle, 1986; Swanson et al., 1984). As debris accumulates in streams, it creates pools that provide important habitat for rearing salmonids, traps nutrient-laden organic matter, and supports aquatic insects and other food items for fish (Heifetz et al., 1986; Murphy et al., 1986). LWD accumulations contribute to bankfull width and stream edge; edge habitat is important for salmonid survival at high flows (Robison and Beschta, 1990). Coho salmon and Dolly Varden char prefer habitat cover provided by LWD and pools formed by LWD, particularly during juvenile rearing. Stable LWD accumulations in first- and second-order tributary streams store large amounts of sediment (Keller and Swanson, 1979; Heede, 1985; Swanson and Lienkaemper, 1978), buffering sediment transport to downstream pink salmon spawning areas (pink salmon are limited by quality of spawning gravels and not rearing habitat) (TLMP, 1997).

LWD often changes the morphology of streams, creating a longitudinal stair-stepped pattern (Heede, 1985). Individual steps that are too high can block upstream fish passage, particularly at lower flows. These blockages are rarely total, however, and are relatively easy to breach or physically remove (Bryant, 1983). At higher flows, fish often can jump over what appear to be complete barriers at lower flows.

Large accumulations of logging slash in streams can also block fish passage. Logging slash may include larger branches and short sections of boles without rootwads. Much of this type of LWD is floatable and, therefore, unstable (Bryant, 1980). Unstable accumulations of LWD can wash out and destabilize streambanks, potentially reducing fish habitat and overall stream productivity.

Blowdown of trees is a natural phenomenon in Southeast Alaska. Evidence indicates that blowdown does not occur randomly though it is widely distributed across the landscape. Natural factors and the shape of created openings determine the probability of blowdown in adjacent stands (Harris, 1989; Moore, 1977). The TLMP Revision (1997) standards and guidelines direct that blowdown potential be considered when designing harvest units. Some blowdown can contribute to the LWD needed to maintain instream habitat.

Fish Enhancement Projects

Major habitat improvements, including a fish passage facility, habitat structure placement, and riparian enhancement, have been made to a few streams in the Project Area. Table 3-8 shows the location of existing and planned Forest Service stream enhancement projects and the years they were implemented or scheduled for development. These improvements include a fish passage facility in Rio Roberts (Watershed C49B.2200) and habitat structures in Control Lake (Watershed C49B.2400). The Rio Roberts fish pass project is expected to produce the single greatest increase in fish production potential.

Table 3-8
Existing and Planned Stream Enhancement Projects in the Control Lake Project Area

Name	VCU	ADF&G Stream No.	Project Type	Year Planned (P), Implemented (I), or Deferred (D)
Rio Roberts	596,576,575	102-70-58	Fishpass	1988(I)
			Bioenhancement	1988-1991 (I)
Rio Beaver Creek	597	102-70-58	LWD monitoring	1944 (P)
			Basinwide rehab.	1944 (P)
			Slide seedings	1989,1992,1993 (I)
North Thorne River	578	102-70-58	LWD rehabilitation	1993 (P)
Steelhead Creek	595	103-60-29	Planting conifers	1991 (I)
			LWD rehabilitation	1993 (P)
			Fishpass	1997 (P/D)
Logjam Creek	577	106-30-53	LWD rehabilitation	1996, 1997, 1998 (P)
Big Salt Lake			Chinook smolt released	1988, 1991 (I)
Control Lake	596	102-70-58	LWD rehabilitation	1991 (I)
Black Bear Lake	595	103-60-31	Bioenhancement	1956 (I)

SOURCE: TLMP, 1991a, and personal communication with the Thorne Bay Ranger District Forest Service and ADF&G FRED Division Management Indicator Species

MANAGEMENT INDICATOR SPECIES (MIS)

Coho Salmon

Pink Salmon

Dolly Varden Char

Management Indicator Species

An analysis of the effects of environmental action on every plant and animal species in the Project Area would be costly and time-consuming. Consequently, Forest Service EIS projects traditionally select certain species that are believed to generally characterize the existing conditions and indicate the effects of environmental activities for all species. These are known as MIS. For this EIS, coho and pink salmon are the MIS for anadromous fish species and represent two different phases of salmon life history: spawning/egg incubation and freshwater rearing. Dolly Varden char represents resident species for the Control Lake Project Area. Models were used to estimate fish habitat capability for MIS. These models are indicators of past activities and projected changes in habitat due to management practices. Their purpose is to assist in characterizing the existing habitat potential and comparing alternatives by management practice. Details of the habitat capability models for coho and pink salmon, and Dolly Varden char are described below.

Coho Salmon

Coho Salmon

Coho salmon depend heavily on quality rearing habitat for their health, growth, freshwater survival, and marine survival. The life pattern of anadromous cutthroat and steelhead trout is similar to coho. Coho juveniles spend an average of two years in freshwater streams and rivers, attaining a size of about 4 to 6 inches before migrating to salt water as out-migrating smolts. After an average of two years in the ocean, they return as mature adults, reaching 6 to 20 pounds.

The time juveniles spend in fresh water limits this species' habitat capability. Because coho juveniles spend so long in fresh water, the quantity and quality of a stream's year-round habitat is very important to their survival. The number of outmigrating smolts the streams produce determines the number of adult coho available to the subsistence, sport, and commercial fishery.

Other factors that determine adult spawner escapements include human manipulation of salmon stocks. Coho salmon stocks in Southeast Alaska are not suffering the negative effects of artificial enhancement on a broad scale; however, those in the Klawock River, which is adjacent to the Project Area, may be affected by such action. Halupka et al. (1993) notes that Klawock, which has a fish hatchery, is experiencing overfishing of hatchery returns. Wild stocks with migration patterns similar to hatchery fish potentially are threatened by this same overexploitation.

LWD is critical in providing sufficient quality rearing habitat for juvenile coho salmon. LWD serves as a source of nutrients (Bryant, 1983); it also creates the deep, quiet pools, undercut banks, and backwater sloughs and channels on which the coho juveniles depend for their survival (Heifetz et al., 1986). Past management activities, such as timber harvesting to stream banks, have reduced LWD recruitment, disturbed off-channel habitat, and decreased winter stream temperatures. Because of the importance of LWD for coho production, its abundance in streams is a major parameter used in the coho habitat capability model (TLMP, 1991a).

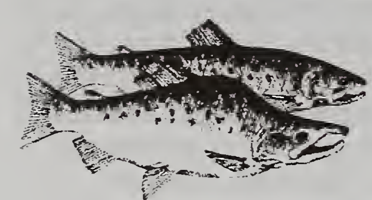
The Project Team used the coho habitat capability model to determine coho habitat capability and the effects of past logging practices in each VCU for the period 1954 to 1995. First, the Project Team developed smolt abundance values by estimating smolt habitat capability for the old-growth condition based on all available population estimates attributed to specific stream channel types in Southeast Alaska (TLMP, 1991a). They then applied the estimated smolt abundance, by representative stream class and channel type, to all streams within each VCU for the conditions in 1954, the period before major logging when LWD was abundant. Then the Project Team estimated change in LWD in streams, as a function of riparian zone harvest, and rate of decay and addition of LWD. An adjustment factor for smolt abundance, based on quantity and importance of estimated LWD, was then applied to the corresponding streams to determine change in potential coho habitat capability. The Project Team, thus, estimated the habitat capability and determined the relative effects of logging in each VCU between 1954 and later years. The changes in coho salmon habitat capability from 1954 to 1995 shown in Table 3-9 are due to past harvest and enhancement activities (i.e., fishpass facilities installation).

The habitat capability model predicts that, by 1995, total Project Area coho habitat capability will increase by 4 percent. The major reason for the increase is the installation of fish passage facilities, particularly in the Rio Roberts drainage. The model predicts the increase in coho salmon productivity in the Rio Roberts system (VCU's 576, 596) after installation of the passage facility will be the highest in the Project Area, as much as 48 percent. The highest habitat capability in the Project Area, equal to about 25 percent of all coho habitat capability, is the lower Thorne River (VCU 597) just below the confluence with the North Thorne River. This includes the Rio Beaver and Goose Creek watersheds. Other areas (VCU's 574, 575, 576, 578, and 596) with large streams, including the rest of the Thorne River and its tributaries and Hatchery Creek, account for a majority of the remaining coho potential in the Project Area (about 51 percent). The model estimates a decrease in coho potential for VCU's 578, 595, and 597. This decrease is the result of decay and loss of LWD in areas that were logged up to the stream bank in Class I streams between 1954 and 1979.

Table 3-9
Coho Salmon Habitat Capability 1954 to 1995 by VCU

VCU	1954	1991	1995
574	41,400	41,500	41,500
575	43,500	43,600	43,600
576	36,200	54,000	54,000
577	26,800	26,800	26,800
578	49,600	49,600	49,600
591	16,500	16,500	16,500
592	15,500	15,500	15,500
593	16,800	16,800	16,800
594	23,000	23,000	23,000
595	19,800	19,800	19,800
596	53,700	57,000	57,000
597	121,000	119,500	119,300
Total	464,000	483,600	483,300

SOURCE: TLMP 1990 Habitat Capability Model.
Note: Numbers also include smolt production in lakes.


Pink Salmon

Pink Salmon

Pinks (humpback) are the most widely distributed salmon in Southeast Alaska. They are important to the commercial fishery of Southeast Alaska; more pink salmon are harvested than any other species— an annual average of 85 million pounds between 1979 and 1988 (USDA Forest Service, 1992c). Pink juveniles go to sea immediately upon emergence from the gravels of coastal streams. They mature in the ocean for two years before returning to spawn. Spawning gravel quantity and quality is thought to be the primary factor that limits pink spawning habitat capability. Substrate composition, water quality and quantity, and water depth and velocity are critical to successful salmon spawning and incubation. Spawning generally occurs in riffles; preferred sites are at the pool-riffle interface. Eggs incubating in the gravels require a constant supply of clean well-oxygenated water.

Management actions that increase stream sediment levels, destabilize stream spawning habitat, and alter accessibility to migrating juveniles and adults could harm spawning and incubation habitat. An increase in stream sediment levels can affect egg survival. Activities that affect fish passage, reduce migratory holding areas, increase stream temperature, and decrease available dissolved oxygen in migratory holding areas also can affect juvenile and adult migration. Migratory holding areas are those deep quiet pools where adults school up to rest. Changes in streambank stability, lateral scouring (widening and shallowing), and changes in sediment and bedload routing can reduce these areas. Harvest near the stream can affect bank stability and lateral scouring. This affects the watersheds' ability to retain storm runoff and flood waters. Watershed stability and LWD influence changes in sediment and bedload routing.

Studies have been conducted on Southeast Alaska pink salmon, including the relationship among stream sediment, egg survival, and pink salmon returns to streams (Sheridan et al., 1984; Pella and Myren, 1974; Sheridan and McNeil, 1982). The studies have established no relationship between upland management and escapement. Food sources, predators, offshore and nearshore commercial fish harvests, water temperatures, and many other factors influence ocean survival.

The model estimates of pink salmon habitat capability are based on estimates of available spawning habitat in each VCU (Table 3-10). The Project Team first determined average available pink salmon spawning area by channel type for Tongass National Forest streams typically used by pink salmon and not other species. They then applied these estimates to streams in each VCU that pink salmon can access. Unlike coho salmon habitat capability estimates, prescribed logging activity does not influence pink salmon model estimates. This is because studies inside Southeast Alaska do not show a direct tie between upland (land not immediately adjacent to streams) management and pink salmon numbers; therefore, the model does not quantitatively evaluate effects of past management activities on pink salmon.

The model predicts that by 1995 Project Area habitat capability for pink salmon will increase by 4.3 percent (Table 3-10). Habitat capability has only changed as a result of enhancement projects, such as fishways and spawning channels. Table 3-10 shows pink salmon capability from the combination of naturally available habitat and additional habitat resulting from fish passages. The Thorne River Watershed within the Project Area (VCU's 575, 576, 578, 596, and 597) contributes approximately 64 percent of the combined pink salmon habitat capability. The increase in VCU's 576 and 596 assumes future successful use of a fish pass installed in 1988 on the Rio Roberts drainage. Observations at the fish pass, however, indicate that pink salmon still do not get past this barrier. Consequently, the predicted increase in values has not occurred. VCU's 591, 592, 593, and 594 contribute 26 percent of the combined pink salmon habitat capability. These VCU's combined make up the entire western end of the Project Area. This includes large streams such as the Nossuk River, Elevenmile Creek, and Shinaku Creek. VCU's 574 and 577 contribute less than 3 percent of the combined adult pink salmon habitat capability. Both of these VCU's include only the upper watershed of Hatchery and Log Jam creeks. Their lower watersheds, which are probably more productive, are outside of the Project Area. Other factors (such as temperature and watershed disturbance) may affect habitat capability for all three species, but these effects have not been quantified on a Forest-wide basis.

Dolly Varden

Dolly Varden Char

Dolly Varden char were selected to represent resident fish habitat because (1) data on the species' habitat requirements are readily available, and (2) they are found over the full spectrum of resident fish habitats. They are also present in their anadromous form in the area. Substrate composition, water quality and quantity, and water depth and velocity are critical to successful Dolly Varden spawning and incubation of eggs to fry. Dolly Varden, like coho salmon, depend heavily on quality rearing habitat for their health, growth, and freshwater and marine survival. Dolly Varden juveniles spend 1 to 4 years in fresh water before migrating to salt water as outmigrating smolts. Their habitat capability, like that of the coho, is directly influenced by LWD recruitment. Anadromous Dolly Varden habitat needs are much like those of the coho salmon, except that some Dolly Varden may live their whole life in fresh water.

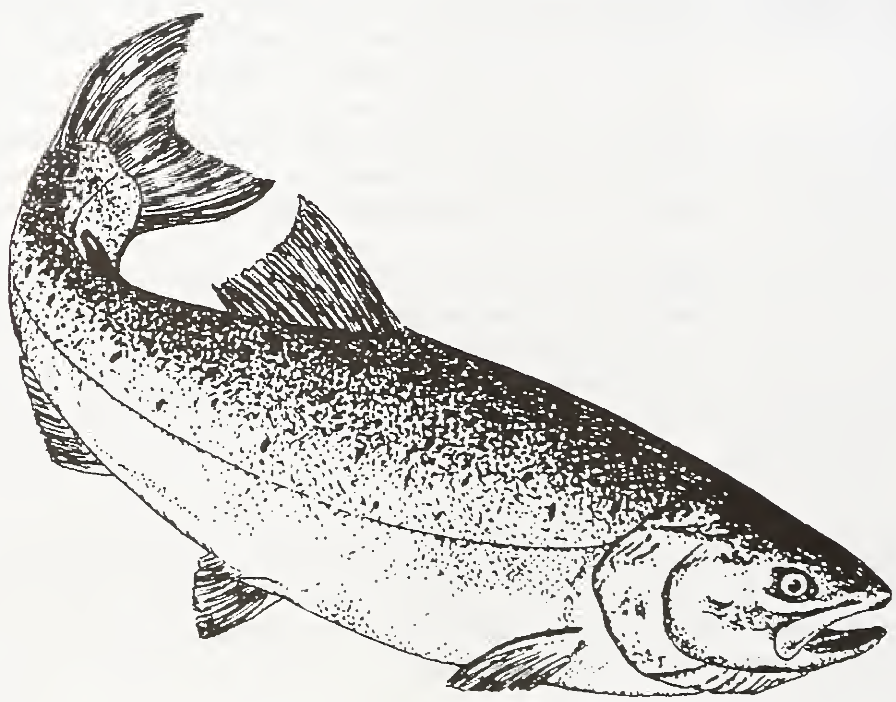
The model estimates of Dolly Varden habitat capability used methods similar to those for coho, with LWD abundance a major component in the estimate. Differences included (1) different density values were used for Dolly Varden, (2) estimates included Class I and II streams, and (3) habitat capability is for resident fish not smolts.

Table 3-10
Pink Salmon Habitat Capability 1954 to 1995 by VCU

VCU	1954	1991	1995
574	1,246,300	1,246,300	1,246,300
575	9,652,400	9,652,400	9,652,400
576[2/]	2,353,100	4,656,200	4,656,200
577	624,300	624,300	624,300
578	5,525,200	5,525,200	5,525,200
591	4,994,900	4,994,900	4,994,900
592	2,302,500	2,302,500	2,302,500
593	5,618,800	5,618,800	5,618,800
594	3,242,000	3,242,000	3,242,000
595	4,046,000	4,046,000	4,046,000
596[2/]	2,216,000	2,435,000	2,435,000
597	17,270,000	17,270,000	17,270,000
Total	59,090,800	61,613,000	61,613,000

SOURCE: TLMP 1990 Habitat Capability Model.
1/ % = Percent difference between 1954 and indicated year.
2/ Values include projections of additional productivity due to installation of a fish ladder in Rio Roberts creek; however, no pink salmon have been observed above the fish ladder.

Table 3-11 shows Dolly Varden habitat capability and percent change from 1954 to 1995. Estimates follow those of coho salmon except they show no beneficial effect from the addition of fish passage facilities. The model shows that Project Area habitat capabilities decreased by 0.26 percent from 1954 to 1995 as a result of loss of LWD from past logging activity. The larger streams and those containing large lake systems have the highest habitat capability



potential of the region. VCU's 574, 575, 577, and 597 each have approximately the same habitat capability values—between 13 and 15 percent. Combined, they make up 57 percent of the total for the region. One of the reasons habitat capability is high in these systems is that they all are large river systems that include large lake areas. VCU's 576, 578, and 596 also have a high portion of the Project Area production potential. These VCU's correspond to different segments of the Thorne River watershed including Control Lake Creek, Cutthroat Creek, North Thorne River, and upper Rio Roberts.

Marine Resources

Southeast Alaska's coastline consists of approximately 30,000 miles of tidal shoreline, roughly 60 percent of the total Alaskan coast. This region contains highly diverse habitats that collectively account for the complex estuary and tidal environments of Southeast Alaska. The marine environment of the Project Area encompasses a wide variety of ecosystems. The shallow marine waters and associated mud flats and estuaries found in the protected coves and bays provide habitat for some important species such as Dungeness crab and juvenile salmon. They are part of a complex and dynamic ecosystem that includes shrimp, flatfish, marine worms, echinoderms, sponges, sea anemones, shellfish, plankton, marine algae, and other organisms. Marine resources along the Big Salt Lake and Elevenmile shorelines are used extensively by local residents.

Table 3-11
Dolly Varden Char Habitat Capability 1954 to 1995 by VCU

VCU	1954	1991	1995
574	222,600	222,900	222,600
575	213,000	213,000	213,000
576	121,500	121,500	121,500
577	252,000	251,700	251,600
578	145,800	145,700	145,700
591	35,700	35,700	35,700
592	62,100	62,100	62,100
593	76,400	76,400	76,400
594	85,900	85,900	85,900
595	69,200	69,200	69,100
596	123,400	123,400	123,400
597	255,400	252,100	251,600
Total	1,662,900	1,659,600	1,658,500

SOURCE: TLMP 1990 Habitat Capability Model.
Note: Numbers also include production in lakes in each VCU.

Major Watersheds and Anadromous Fish Streams

Watersheds are areas that contribute water to a drainage or stream. They are portions of the landscape in which all surface water drains to a common point. Generally, major watersheds in the Project Area (Figure 3-3) contribute the most to fish production; all of these contain anadromous fish stocks and are characterized by more stable flow regimes and greater amounts of habitat than smaller drainages. The general distribution of anadromous fish in relationship to watersheds is described below.

The lower reaches of larger streams in the Project Area, including reaches within the intertidal zone, contain the bulk of spawning habitat for pink and chum salmon. These species typically do not rear in fresh water; fry emigrate to salt water shortly after emergence. Barriers or breaks in stream gradient that pose little or no problem for other salmonids often impede the upstream migration of pink and chum salmon. In contrast, coho salmon and steelhead ascend such barriers with ease and often are distributed much higher in the drainage basins. Coho salmon may occupy small streams with relatively high gradients. Typically, drainages in the Project Area with numerous braided side channels and large amounts of instream LWD contain the most rearing habitat for juvenile coho salmon.

The following streams and lakes contain most of the Project Area steelhead (the anadromous form of rainbow trout): Log Jam Creek (Watershed C21C), Hatchery Creek (C20D), Thorne River (WC49B/C45D), Balls Lake (C49B.2000), Control Lake (C49B.2000), Angel Lake (C49B.1000), Snakey Lakes (C49B.2700), Cutthroat Lake (C49B.2000), Shinaku Creek (DO38), Steelhead Creek (C95B), Black Bear Creek (C93A), and Nossuk Creek (D12A.0100).

Sockeye salmon are found mainly in drainages containing lakes. The following streams in the Project Area contain sockeye: Log Jam Creek (Watershed C21C), Hatchery Creek (C20D), Thorne River including North Thorne River (C49B/C45D), Balls Lake (C49B.2000), Control Lake (C49B.2000), Angel Lake (C49B.1000), Snakey Lakes (C49B.2700), Lake Galea (C20D), Cutthroat Lake (C49B.2000), Black bear Creek (C93A), and Black Lake (C93A).

Both cutthroat and Dolly Varden char may be present either as anadromous forms or as resident fish in lakes and reaches of streams not generally used by anadromous species. Resident rainbow trout have been introduced into at least one lake drainage (Black Bear Lake). Although there are no known chinook (king) salmon streams in the Project Area, they do occur in adjacent marine waters.

Appendix D in the DEIS contains a more detailed summary by major watershed of available information for anadromous fish streams (identified by ADF&G stream number) and lakes in the Project Area.

Aerial view of Angel Lake looking northwest

Vegetation and Timber Resources

Key Terms

Advanced Regeneration—Natural conifer reproduction established beneath an existing forest canopy; comprised of trees ranging from 5 to 20 feet in height.
Allowable Sale Quantity (ASQ)—The maximum quantity of timber that may be sold in each decade from suitable scheduled lands covered by the Forest Plan.
Basal Area (BA)—The area of the cross section of a tree stem, or group of trees, measured at 4.5 feet above ground; usually presented as total square feet per acre.
Blind Lead—An area within a harvest unit that is difficult to yard (removed felled timber) with conventional cable logging systems on convex slopes.
Board Foot (BF)—Lumber or timber measurement term. The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.
Climax Plant Community—The final or stable biotic community in a successional series which is self-perpetuating and in dynamic equilibrium with the physical habitat; the assumed end point in succession.
Commercial Forest Land (CFL)—Land that is capable of producing continuous crops of timber (20 cubic feet per acre of tree growth annually, or at least 8 MBF/acre).
Ecosystem—all of the organisms in a given area interacting with the physical environment so that the flow of energy leads to an exchange of materials between living and nonliving parts within the system.
Even-aged Management—The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The age difference between trees in the canopy level usually does not exceed 20 percent. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.
Falldown—The difference between planned or scheduled harvest and that which is attained after implementation.
Forest Land—Land at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.
MBF—Thousand board feet.
MMBF—Million board feet.
Partial Cutting—Removal of selected trees within a forest stand in any variety of spatial patterns. This may include thinning, selective cutting, shelterwood or an overstory removal.
Plant Association—A basic unit of vegetation classification based on land management potential, species composition, successional patterns, and the climax plant community.
Precommercial Thinning—The practice of removing some of the trees less than merchantable size from a stand to improve tree growing space and promote rapid growth. Trees will grow faster due to reduced competition for nutrients, water, and sunlight.
Reserve Trees—Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.
Shade Tolerance—Tree species that have physiological growth processes adapted to shaded environments. Western hemlock is a shade tolerant species. Other tree species tolerance to shade may range from tolerant to intolerant.
Silvical Characteristics—Physiological and genetic characteristics of individual tree species and the ecological characteristics (biological and environmental factors) of the site which enable a specific species to be adapted to a particular and unique site.
Silvicultural Practices—Management techniques used to modify, manage and replace a forest over time. Silvicultural practices are classified according to the method of carrying out the process (shelterwood, seed tree, clearcut, commercial thinning, etc.).
Silviculture—The art, science and practice of controlling the establishment, composition,

structure and growth of trees and other vegetation in forest stands.
Site Index—A measure of a forest areas relative productive capacity for tree growth. Measurement of site index is based on height of dominant trees in a stand at a given age.
Succession—A series of dynamic changes by which one group of organisms succeeds another through stages leading to a potential natural community or climax. The process of plant community development after disturbance involves changes in species composition over time.
Suitable Forest Land—Commercial forest land identified as having the biological capability to sustain long-term timber production, that has not been withdrawn from timber production.
Uneven-Aged Management—The application of management techniques which will maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.
Volume Class—Classification system used to differentiate timber stands into similar average volume per acre categories or strata.

Introduction

The Control Lake Project Area encompasses 201,371 acres. This area consists of both National Forest System lands (169,423 acres) and lands owned by private and state agencies (29,365 acres). Lakes within the Project Area encompass 2,583 acres.

The landscape of central Prince of Wales Island is characterized by intermixed stands of productive hemlock/spruce forest, nonproductive forest stands, and nonforested areas. The spatial distribution of these stands can be traced back to the glacial and climatic history of the area which combined to shape soil development.

Soil drainage is the most influential factor on Prince of Wales Island determining the type and amount of vegetation that grows. Poorly drained soils, such as those overlaying compact glacial till, result in the development of nonforested muskeg sites or unproductive forest stands. Well-drained soils, such as those overlying limestone, result in highly productive forest stands.

Land Use Designations and Desired Condition

The Revised Forest Plan (USDA Forest Service 1997) describes the desired condition for each LUD. The Control Lake Project Area contains a variety of LUD's. Timber harvest will occur primarily in three LUD's within the Project Area.

In areas determined to be suitable forest land within the Timber Production LUD, natural ecological processes will be replaced by timber management practices. The landscape will have a highly modified appearance, dominated by timber harvest and road building activities. These areas will contain timber harvest units of varying sizes and ages among areas of old growth and nonforest vegetation.

The Scenic Viewshed and Modified Landscape LUD's will also yield timber, but with more restrictions. The future appearance of these areas is expected to show a mosaic of timber harvest units of varying sizes and ages of origin interspersed with areas of old growth and nonforest vegetation. The landscape, as viewed by most forest visitors, will have a modified but still basically "natural" appearance.

Ecosystem Management

Under ecosystem management, new silvicultural strategies are examined, and older strategies re-evaluated, to bring about a different balance in resource production in managed forests. The basic philosophy of this concept is to mimic natural processes, and to maintain options for future management while more knowledge becomes available about the impacts of forest management activities on the ecosystem.

Forest Land Classification

National Forest System lands are defined by vegetative cover, soil type, and administratively designated land use. This classification scheme is intended to show the amount of land that is covered by forested vegetation with further divisions to show the amount of that land that is capable of timber production.

Non-Forest Land

Nonforest land is defined as National Forest System land that is biologically unable to support at least a 10 percent cover of forest trees. This land includes muskegs, rock outcrops, talus slopes, alpine vegetation, and river systems among others. This area was classified through timber type map GIS coverages. About 6 percent of the National Forest System land in the project area or 10,840 acres are classified as nonforest land.

Forest Land

Forest land refers to National Forest System land that has at least 10 percent tree cover of any size, or formally had such tree cover and is not currently developed for nonforest use. This area was classified through timber type map GIS coverages. About 94 percent of the National Forest System land in the project area or 158,582 acres are considered forest land.

Commercial Forest Land

Commercial forest land is land that is biologically capable of producing continuous crops of timber. The Forest Service has defined commercial forest land as land that is capable of producing at least 20 cubic feet of annual tree growth per acre or contains at least 8 MBF of net timber volume per acre (USDA Forest Service, 1978). Second-growth stands that have experienced regenerative success after disturbance qualify as commercial forest land. The Control Lake Project Area contains 86,628 acres of commercial forest land in the National Forest System land base.

Noncommercial Forest Land

Noncommercial forest land is land that does not support enough timber volume or is not productive enough to meet the criteria for commercial forest land. About 71,954 acres of the National Forest System land base in the Project Area is considered noncommercial forest land.

Suitable Forest land

Forest land is further classified as tentatively suitable and suitable for timber harvest. This classification scheme is intended to show the amount of land within the Project Area that is removed from timber production for various reasons.

Under the TLMP Revision (1997), tentatively suitable forest lands are those lands that meet the following four criteria: (1) the land is forest land as defined under the NFMA; (2) technology is available to ensure timber production from the land without irreversible resource damage to soils productivity, or watershed conditions; (3) there is reasonable assurance that the land can be adequately restocked as provided under NFMA; and (4) the land has not been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service (e.g., Wilderness Areas, Research Natural Areas). Suitable forest lands include the portion of tentatively suitable lands that are appropriate for timber production based on the Forest Plan LUD's and standards and guidelines. The LUD's that preclude timber production under the 1997 TLMP Revision include: Old-growth Habitat, Semi-remote Recreation, proposed

Research Natural Areas, Beach and Estuary Fringe, and others. Several forest-wide standards and guidelines also preclude timber production under the 1997 TLMP Revision. These include the following standards and guidelines: Beach and Estuary Fringe, Riparian, Karst and Cave, and others.

The suitable forest land base for the Control Lake Project Area under the 1997 TLMP Revision is approximately 26,545 acres. This represents a 45 percent reduction from the suitable base under the 1991 TLMP Draft Revision (used in the Draft EIS). The new suitable base consists of 22,786 acres of old-growth forest and 3,759 acres of second-growth forest.

Previous Harvest

The earliest commercial timber harvest on central Prince of Wales Island occurred during the early 1940s. This coincides with the increased need for high quality spruce used in airplane construction prior to World War II. The amount of logging at this time was very limited and restricted to easily accessible coastal shorelines as there were no roads in the area. Development of the logging road system on central Prince of Wales Island began in earnest in the mid-1960s. This marked the beginning of intensive land-based logging efforts which continue today. Table 3-12 shows the total area that has been previously harvested since 1940, only 6,844 acres of this total is currently within the suitable timber base.

Table 3-12
Past Timber Harvest Acreage: Control Lake Project Area

Harvest Period	Acres Harvested[1/]
1940 to 1949	20
1950 to 1959	40
1960 to 1964	30
1965 to 1969	2,337
1970 to 1974	25
1975 to 1979	187
1980 to 1984	244
1985 to 1989	3,115
1990 to 1994	4,605
Total	10,603

Source: USDA Forest Service, Ketchikan Area GIS Database.
1/ Includes previous harvest acres on lands currently defined as not suitable for timber harvest, such as congressionally designated TTRA stream buffers.

Silvical Characteristics of Tree Species

Silvical characteristics are the physiological (genetic) characteristics of the individual tree species and ecological characteristics (physical and biological requirements) that combine to produce the tree that exists on any particular (unique) site. The general silvical characteristics of the tree species within the Control Lake Project Area are described below and are used as the basis for managing the species within stands of timber.

Sitka Spruce

Sitka spruce (*Picea sitchensis*) is found along a narrow strip of the northern Pacific coast from northern California to south-central Alaska. Throughout most of its range it is associated with

stands of western hemlock. The high strength-to-weight ratio has made this species very valuable for lumber, specialty construction, and paper products.

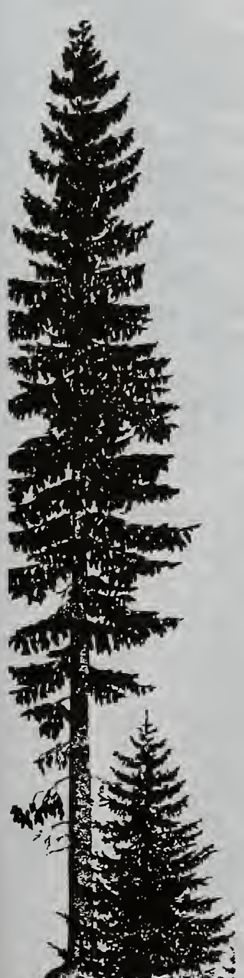
In Southeast Alaska, spruce is generally classified as intermediate shade tolerant, being less tolerant of shading than western hemlock. Sitka spruce is a prolific seed producer and under natural conditions has the ability to germinate on most any seedbed. Seedling survival is best on exposed mineral soils or mixed mineral and organic soils with adequate moisture and drainage.

Spruce is a shallow-rooted species and blowdown is the most prominent damaging agent to spruce in Southeast Alaska. Thin bark also makes it very susceptible to damage from logging. Injuries from logging or adjacent windfall frequently introduce decay-causing organisms to standing trees.

Western Hemlock

Western hemlock (*Tsuga heterophylla*) is found along the northern Coast, Cascade, and Rocky Mountain ranges. Throughout much of its range it is associated with stands of Sitka spruce. The strength and long cellular fibers have made this species valuable for construction and paper products.

Western hemlock is very tolerant of shade and is able to germinate and grow in the understory. It produces an abundant quantity of lightweight seeds which have the ability to travel long distances and germinate on most any seedbed. In Southeast Alaska, germination and initial growth is best in mineral soils with a high amount of organic matter. Because of its shallow rooting habit, hemlock is subject to windthrow. Although less susceptible to bark injury than spruce, hemlock injury often will result in greater volume loss due to decaying organisms. Dwarf mistletoe is a common parasite that reduces growth on western hemlock throughout Southeast Alaska.


Sitka spruce

Mountain Hemlock

Mountain hemlock (*Tsuga mertensiana*) is found between sea level and timberline along the northern Coast, Cascade, and Rocky Mountain ranges. Mountain hemlock often replaces western hemlock at the higher elevations because of its adaptation to cooler sites. It is often present at lower elevations on poor sites because of its ability to extract tightly bound nutrients from the organic soil.

Western Red Cedar

Western red cedar (*Thuja plicata*) is found along the northern Coast, Cascade, and Rocky Mountain ranges. Throughout much of its range it is associated with stands of Douglas-fir and western hemlock. The durability and rot resistant qualities of red cedar have made this species valuable for shingle products, utility poles, and various pulping products.

Western red cedar is shade tolerant, although less tolerant than western hemlock. In Southeast Alaska this species becomes established on the lower elevation, warmer sites. Western red cedar germinates best on exposed mineral soil, but due to its slow growth does not compete well against western hemlock. Western red cedar is able to survive and grow on soils that are low in nutrients, therefore outcompeting other species on these sites. It is less susceptible to most decay causing organisms in comparison to other species, yet due to its long life span, heart rot in trees is common.

Yellowcedar

Yellowcedar (*Chamaecyparis nootkatensis*) is found along the west coast and islands of British Columbia and Southeast Alaska. Within Southeast Alaska, yellowcedar is found in association with stands of western hemlock and occasionally mountain hemlock or western red cedar. Yellowcedar is one of the slowest growing conifers in the Northwest, producing highly durable wood with good milling qualities.

Yellowcedar is classified as intermediate shade tolerant in the northern part of its range. It germinates best on exposed mineral soils, yet hemlock and spruce are stronger competitors on these sites. This species grows better on colder sites, in contrast to western red cedar, and is therefore found at mid-to upper elevations. It is resistant to most decay causing organisms, yet due to its long life span, damaged trees are common.

Lodgepole Pine

This species (*Pinus contorta*) is common to muskegs and on benches near lakes. It is shade intolerant, and develops best in the borders between muskeg and hemlock stands. Lodgepole pine is seldom harvested commercially in Southeast Alaska.

Plant Communities and Cover Types

Forest Plant Communities

The Control Lake Project Area is a mosaic of coniferous forest interspersed with muskeg, shrubland, alpine vegetation, and beach fringe plant communities. Forest vegetation has been categorized using the Tongass Forest Plant Association Management Guide (De Meo 1992), which describes potential vegetative climax communities that may develop over time in response to soil, climate, plant geography, and evolution. This classification system assists land managers and resource specialists to predict the outcome of various vegetative manipulations. Based upon GIS information and field observations, the forested portion of the Project Area exhibits six plant series (Table 3-13).

Table 3-13
Forest Plant Series in the Control Lake Project

Plant Association Series	Acres
Western Hemlock	50,510
Sitka Spruce	2,129
Mixed Conifer	17,268
Mountain Hemlock	10,835
Western Hemlock - Western Red Cedar	32,897
Lodgepole Pine	4

Western Hemlock Series

The Western Hemlock Series is common throughout the Project Area and typically occurs on uplands such as hills, mountain sideslopes, and footslope landforms exhibiting somewhat poorly drained to well-drained soils. It may occur from sea level to timberline, but is usually below elevation 1,000 feet. Although Sitka spruce occurs within these stands, it provides less

than 25 percent of the overstory cover. The shrub layer is dominated by blueberry and rusty menziesia although devils club can be a major component in wet areas. This association occurs primarily on the medium to highly productive sites.

Sitka Spruce Series

Plant associations in this series are dominated by Sitka spruce in the overstory but western hemlock may provide up to 40 percent cover as a codominant. The plant associations in the Sitka Spruce Series typically are associated with disturbed sites such as riparian areas, alluvial fans, or avalanche chutes from sea level to elevation 1,500 feet.

Western hemlock

Mixed Conifer Series

Mixed conifer associations are identified by an open conifer overstory which is not dominated by any single species. Overstory species include mountain hemlock, western hemlock, yellowcedar, and western red cedar. Lodgepole pine and spruce also occur in varying proportions. This series is mostly influenced by poor soil drainage and generally found in the uplands associated with muskegs or in lower elevations surrounding and associated with glacial drumlins. These communities are stable and slow to change. Because tree growth on these sites is slow, recovery from severe disturbance likely will be slow.

Mountain Hemlock Series

These associations are found primarily on the cold, high-elevation sites, above the western hemlock series, on upper mountain slopes and mountain summits. Mountain hemlock is the dominant overstory tree species with yellowcedar common at the lower elevation range. The shrub layer is dominated by blueberry. Productivity is limited due to the shorter growing season at high elevations and by poor soil drainage and shallow soils common to some areas.

Western Hemlock-Western Red Cedar Series

These associations are commonly found at the lower elevations of mountain slopes and in the lowlands. Western red cedar is primarily found in the elevations below 900 feet. The overstory is dominated by western hemlock, with western red cedar occupying 10 to 25 percent of the forest canopy. Blueberry is a common shrub species. This series is most common on moderately to highly productive sites in rolling hill country, low hills and mountain slopes. Generally, this series is situated in warmer areas in association with the lower elevations of the Western Hemlock Series.

Lodgepole Pine Series

These associations are found in an area of transition from poorly drained mixed conifer to nonforest muskeg. The stands generally have an open canopy and site productivity is very low. Lodgepole pine cover averages 20 percent and the combined cover of other conifers is less than 10 percent. The understory is characterized by shrub-like yellowcedar and mountain hemlock with lodgepole pine. These sites are either level or gently sloping and most commonly occur on lowland plateaus with compact glacial till.

Nonforested Cover Types

Nonforested habitats in the Control Lake Project Area include muskeg vegetation, alpine vegetation (including grassland and rock), shrubland (including landslide areas), and estuary habitat. Table 3-14 shows nonforest cover types within the Project Area as mapped within the GIS database.

Mountain hemlock

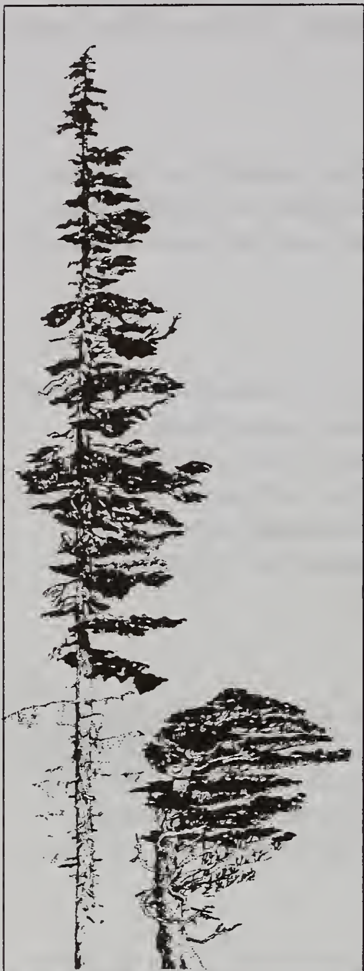


Table 3-14
Nonforested Plant Communities

Community Type	Acres
Muskeg Vegetation	51,768
Alpine Vegetation	2,542
Shrubland	710
Estuary Vegetation	160
Major River Systems	600

Muskeg Vegetation
Muskegs are dominated by sphagnum moss, sedges, and other bog vegetation, but are often characterized by low shrubs, stunted yellowcedar, and lodgepole pine. The water table is at the surface and many small ponds are scattered throughout.

Alpine Vegetation
Alpine meadows are found at high elevations. Species diversity is high and alpine lichen rock outcrops may be present. Sites are moderately drained but some pools may be interspersed on slope benches. Alpine meadows are dominated by cassiope, clubmoss, deer cabbage, grasses and mixed forbs, including mountain heath. Plant cover does not exceed 50 percent within the alpine-rock habitats.

Shrubland
Shrub vegetation is found in areas which are frequently disturbed. These areas may be on rocky or unstable slopes or found within riparian zones. Shrub-dominated riparian zones are found on highly active floodplains. Soils are generally deep and well drained, but flood frequently.

Alder thickets exist between the beach and forest, between the treeline and alpine meadows, and extending down through the forest through avalanche tracks and along streams. Salmonberry, stink current, devils club, ferns, and grasses are the dominant understory vegetation within all these areas.

Estuary Vegetation
Estuarine habitats are transition areas between river systems and tidal saltwater systems. Vegetation consists primarily of sedges, red fescue, and sea milkwort. Bluejoint and sedges dominate low terraces that are infrequently inundated by tides but which have high water tables.

Major River Systems
This cover type category consists primarily of the Thorne River system.

Threatened and Endangered Plant Species

Threatened, endangered, and sensitive plant species are discussed in the *Threatened, Endangered, and Sensitive Species* section.

Timber Classifications

Classification of the timber stands in the Tongass National Forest follow type designations used to differentiate stands by forest type, volume class, and size class. These strata were originally mapped in the 1970s and are the basis of the timber inventory system of the Tongass National Forest.

Volume Class and Forest Type

Forest land on the Tongass National Forest has been classified into volume class and forest type categories. The volume classes are designed to represent a range of net sawlog timber volumes expected to be present. These are defined in the Forest Plan (USDA Forest Service, 1979) and are shown in Table 3-15.

Table 3-15
Net Sawlog Volumes in each Volume Class

Volume Class	Net Sawlog Volume (MBF/acre)
VC3	0 to 8
VC4	8 to 20
VC5	20 to 30
VC6	30 to 50
VC7	50+

Forest type strata identify the dominant overstory species expected to be present in the area. There are four forest types present within the Control Lake Project: Cedar (C), Hemlock (H), Hemlock-Spruce Mix (X), and Spruce (S).

Site Class

Site class is a measure of the relative productive capacity of a parcel of land for tree growth. This measure is used to predict future timber yields (Table 3-16). Site class is directly related to soil type and topographic position. The relationship between tree height and age is used as a measure of site index (SI).

Table 3-16
Site Class Distribution within Control Lake VCU's Site Class Acres[1/]

	Site Class Acres [1/]			
VCU	0 to 40 SI Very Low	41 to 60 SI Low	61 to 80 SI Medium	>80 SI High
574	6,825	937	3,010	3,023
575	6,522	1,439	5,275	4,492
576	4,873	3,130	3,337	3,733
577	9,972	573	2,362	2,182
578	941	1,467	492	3,292
591	3,362	1,887	957	2,240
592	3,549	5,458	1,692	1,992
593	5,069	3,533	2,216	2,345
594	4,493	460	2,412	3,972
595	7,742	1,512	3,893	6,150
596	4,376	2,471	1,591	3,593
597.1	585	973	26	1,464
597.2	4,950	4,593	3,275	8,114
TOTAL	63,259	28,435	30,537	46,593

1/ The site index method of measuring productivity is based on the expected height a tree will grow within a given number of years (50 years for Southeast Alaska). It is difficult to obtain the site index for old-growth stands in Southeast Alaska because their lifelong slow growth characteristics makes it difficult to obtain accurate age and height measurements.

Volume Estimates

The total inventory volume for the Control Lake project is estimated from units inventoried during summer 1993. The average volume calculated for each timber type strata was calculated to provide a volume estimate for suitable forest land within the Project Area. Estimates derived from the inventory are shown in Table 3-17. Table 3-18 shows the percent volume by volume class by species for the Project Area. More specific information on the inventory process and statistical results can be found in the Control Lake Timber and Vegetation Resource Report (Boyce and Goering, 1995).

Table 3-17
Inventory Volume, Trees, and Basal Area per Acre by Volume Class

	VC4	VC5	VC6	VC7
Volume (BF/Acre)[1/]	21,472	29,200	32,561	33,795
Trees/Acre	131	111	104	116
Basal Area/Acre	203	222	225	233

1/ Includes a 17 percent hidden defect, breakage, and utility deduction.

Table 3-18
Percent Volume Composition by Species for Volume Classes

Species	VC4	VC5	VC6	VC7
Sitka Spruce	12.1	16.2	16.9	9.4
Western Red cedar	22.1	16.3	12.8	8.9
Western Hemlock	47.2	55.3	60.3	77.6
Yellowcedar	12.7	6.5	4.2	3.0
Mountain Hemlock	5.2	5.6	5.8	1.1
Lodgepole Pine	0.7	0.1	0.0	0.0
Total	100.0	100.0	100.0	100.0

Proportionality Analysis

The Tongass Timber Reform Act (TTRA 1990) modified the Long-term Timber Sale Contracts in Alaska to "...eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in volume class 6 and 7..." The Forest Service developed the procedures and implementation instructions for conducting proportionality analysis in January 1992. The calculation of proportionality is based on dividing the high volume class acres by the total volume class acres within a Management Area. The proportionality in a Management Area after timber harvest is compared with the proportionality calculated for December 1990 conditions to verify that TTRA is satisfied.

The Control Lake Draft EIS presented proportionality calculations because much of the timber from Control Lake was to be offered to KPC under the Long-term Contract. Now that this contract has been modified, no timber from Control Lake will be offered under the Long-term Contract. Therefore, proportionality calculations are not included in this Supplemental Draft EIS.

Forest Health

A healthy forest can be defined as the renewal and continuation of the forest with minimal repression from biological and physical agents. Various living and nonliving agents, including fires, insects, disease, and animals, alter the natural aging and death process of trees and stands. The following paragraphs describe the most destructive agents, affecting the general health of forest stands, observed during field investigations. Potentially damaging pests not observed but reported to exist at endemic levels in the Project Area include the black-headed budworm (*Acleris gloverana*), the hemlock sawfly (*Neodiprion tsugae*), the spruce beetle (*Dendroctonus rufipennis*), and the spruce aphid (*Elatobium abietinum*) (USDA Forest Service, 1985).

Hemlock Dwarf Mistletoe

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is one of the most widespread pathogens in old-growth forests of Southeast Alaska. Hemlock dwarf mistletoe is an obligate parasitic plant whose primary hosts are western hemlock and mountain hemlock. In general, dwarf mistletoe reduces the vigor and growth rate of its hosts. Dwarf mistletoe produces cankerous swellings in branches that offer an entry point for wood-destroying fungi.

Dwarf mistletoe is present throughout the entire Control Lake Project Area, but infection rates are quite variable for individual stands. It is completely absent in some stands while nearly every tree is infected in other stands.

Yellowcedar Decline

The cause of yellowcedar decline is unknown, but it is generally associated with poorly drained soils. It does not seem to spread from site to site, but it appears to creep from its origins in bog and semi-bog communities to the adjacent forest (Hennon 1990). Dead and dying yellowcedar can be observed throughout the Control Lake Project Area, but this is not necessarily associated specifically with yellowcedar decline.

General Decays

Stem and root decay is one of the greatest single causes of merchantable timber volume loss in the Project Area, although this is not unexpected considering the age of the stands. The younger stands generally show less evidence of decay while the older stands are more likely to be infected and show the signs of stem decay. Red ring rot *(Phellinus pini)*, red belt fungus *(Fomitopsis pinicola)*, yellow ring rot of western red cedar *(Phellinus weirii)*, or root rots *(Heterobasidion annosum* and *Armillaria mellea)* are some common pathogens in the area. Hemlock is generally more susceptible to decay than other species in the area.

Western Hemlock Canker

Western hemlock canker (*Xenomeris abietis*) is causing slowed growth and mortality of western hemlock along well-traveled rock surfaced roads. This occurs in a strip approximately 150 feet wide on either side of the road. It is most evident in occasional patches along each side of Road No. 929 close to Control Lake. It affects the lower branches of large trees and eventually kills the smaller, younger trees. Road dust is suspected to be associated with this problem, and signs of the disease have decreased after paving (Hennon, 1992).

Hemlock Fluting

Hemlock fluting was found occasionally throughout the Project Area. It generally occurs on uplifted coastal beaches and floodplains. Fluting is characterized by the production of deep vertical furrows in the bole of hemlock trees. The presence of furrows reduce the value of hemlock trees for sawlogs and pulping because of irregular grain and the bark that is contained within the stem of the tree. The cause of fluting is unknown but it is believed to have genetic origins. Selection of hemlock trees that do not show early signs of fluting would be desirable during thinning operations to reduce the presence of fluting in future stands.

Windthrow

High winds historically have blown down patches of trees and individual trees throughout the Project Area during winter storms. The prevailing winds are associated with southeast gales (Harris 1989). Recently, storms in the fall and winter of 1968 and 1978 produced patches of blown down trees in the western portion of the Project Area. This appears to be nature's way of reproducing forests in this area since extensive wildfires are precluded by the moist, maritime climate. All commercial species are shallow-rooted and susceptible to windthrow. Overall, the most damage occurs in the high-valued, dense stands of spruce and western hemlock exposed to the ocean winds. This is evident in some areas close to the beach, such as Harvest Unit 592-405, in the western portion of the Project Area.

Characteristics of Windfirm trees:

1) Open grown trees which have been exposed to storm winds throughout their life.
2) Dominant trees with crowns well above the average stand height.
3) Low form class, high stem taper, and are short.
4) Have prop roots, especially on the leeward side.
5) Straight trees, with well-formed stem and no lean.
6) No stem or root decay and no stem swelling.
7) Deep rooted on well-drained sites.
8) Western red cedar, Alaska yellowcedar, and immature alder species.

Silviculture

The practice of silviculture takes into account the interaction of soils, climate, and tree physiology in determining how a stand of trees can be harvested, reproduced, and tended to achieve the desired future condition of the stand. Silvicultural practices are directed at creating and maintaining the type of forest that will best fulfill the objectives of the land manager.

Silvicultural practices by the Tongass National Forest on Prince of Wales Island primarily center around the management of four tree species: western hemlock, Sitka spruce, western red cedar, and Alaska yellowcedar. The silvical characteristics of each species results in the development of different management approaches for a site based on the existing stand condition and the desired future condition.

Criteria for Selection of Silvicultural Harvest System

Several silvicultural systems are recommended to accomplish the management objectives for the Project Area. These recommendations take into consideration the ecological characteristics of the stands selected for harvest and the physical characteristics of the terrain. Silvicultural prescriptions were developed for all 250 units in the alternatives. The prescriptions can be found in Appendix H.

The criteria for the selection of silvicultural methods on the Tongass National Forest are provided in the Alaska Regional Guide (USDA Forest Service, 1983) and are summarized below:

1) Be capable of meeting special management and multiple use objectives.
2) Permit control of vegetation to establish desired species composition, density, and rates of growth.
3) Promote a stand structure and species composition which minimize risks from solar radiation, disease, and windthrow.
4) Use available and acceptable logging methods.
5) Assure that lands can be adequately restocked.
6) Be practical and economical in terms of transportation, harvesting, preparation, and administration of timber sales.
7) Don't base selection solely on the basis of greatest dollar return or highest output of timber.
8) Don't permanently reduce the site productivity or impair the conservation of water and soil resources.

Silvicultural Harvest Practices

The silvicultural harvest systems described below were considered for the Project Area. Some of these methods may emphasize the protection of resources rather than intensive timber production.

Modifications to individual systems may take place in the form of leave tree islands, partial cut buffers, and varying levels of reserve trees. These options are used in combination with the standard silvicultural systems, rather than being used strictly by themselves. Where alternative systems or modifications have been proposed, they are incorporated directly into the silvicultural prescriptions and unit cards presented in Appendix F and H.

Creation of Partial Cut Buffers

Partial cut buffers are created by removing trees in one size class or removing individual trees throughout all size classes along a lake, stream buffer, or unit boundary. Selection of partial cut buffers was identified during field verification. Partial cut buffers are used to achieve objectives for wildlife, visuals or windfirm buffers and typically could be applied adjacent to key resource areas such as wildlife corridors. Partial cut practices can be used with all types of silvicultural and harvest methods where reserve trees are desired.

Reserve Trees

Retaining green trees and snags across the landscape can provide benefits for reforestation, wildlife habitat, and visual resources. The number of trees reserved and the location of reserve trees within a harvest unit will be dependent upon the resource needs of the area, topographic and climatic conditions, and the operational constraints to logging systems. Many of the reserve trees will be placed around the edge of unit boundaries, in wider stream buffers, lake buffers, between landings, and behind blind leads although clumping and redistribution may take place to meet required levels (Region 10 Reserve Tree Selection Guidelines, USDA Forest Service, 1993b).

Table 3-19 presents an estimate of the level of canopy retention and unit volume reduction obtained by each standard silvicultural system used for the Control Lake Project Area. Figures 3-10 through 3-18 are schematic diagrams of harvest type designations. The harvest type designation is a simplified system used during the ID Team process to easily designate a silvicultural system, harvest design, and/or reserve tree level within a unit. Descriptions of these harvest types are provided in the following sections.

Even-Aged Systems

Even-aged systems produce distinct successional stages because the age and size class structure of the trees in the stand are nearly the same. The common systems are the clearcut, shelterwood, and seed tree.

Clearcutting

Clearcutting (*Harvest Types A, B, C, and D*) is the practice of harvesting all the trees on the site and establishing regeneration through natural or artificial methods. Decisions to clearcut are usually based on a number of factors such as insect epidemics, disease control, the desire to influence species composition and growth, and/or the desire to meet the needs of regulated volume production through area control. Clearcutting has historically been the most common method prescribed in southeastern Alaska.

Table 3-19
Silvicultural System and Harvest Type Designations

Silvicultural System	Harvest Type Designation	Canopy Retention (%)	Merchantable Unit Volume Retention (%)
Clearcut	Type A	5	0
Clearcut	Type B	10	5
Clearcut	Type C	5	0
Clearcut	Type D	5 to 15	0 to 10
Overstory Removal	Type E	10 to 15	10
Seed Tree	Type F	10 to 15	10
Shelterwood	Type G	30	30
Shelterwood	Type H	50	50
Group/Single Tree Selection	Type I	65 to 90	65 to 90

Clearcutting is prescribed for units for the following reasons:

1) Spruce-hemlock stands in the Control Lake area are shallow-rooted and are vulnerable to windthrow, especially in stands which have a uniform canopy structure and are exposed to prevailing winds.
2) Clearcutting is the most effective, efficient, and economical means available to reduce the occurrence and control the spread of dwarf-mistletoe by eliminating overstory trees infected with mistletoe.
3) Clearcutting benefits the establishment of shade intolerant species such as spruce by creating seed beds more favorable to spruce, and reduces the competitive advantage of hemlock by destroying more advance regeneration during logging.
4) There is sufficient evidence to show that adequate regeneration is possible from adjacent seed sources to restock sites where this method is proposed.
5) Spruce and hemlock are thin-barked species. During partial cutting, accidental logging damage creates wounds which are susceptible to disease infection.

Other advantages of clearcutting include: (1) the ability to increase wildlife forage production in the short term; (2) reduced harvesting costs per unit volume; and (3) fewer road miles required for the same level of volume harvested.

Some disadvantages of clearcutting include: (1) seedling distribution is uneven, leaving some areas overstocked and/or understocked; (2) species control is poor; (3) reduced protection against erosion, landslides, and water runoff rates; (4) the risk of blowdown along cutting boundaries is increased; and (5) the created openings produce an unnatural appearing landscape and can have visual impacts.

Clearcuts will use at least one of the following forms of snag and green tree reserve strategies: *Type A* clearcuts typically will leave snags and unmerchantable green trees within 50 to 100 feet of the setting boundaries (Figure 3-10). A maximum of 5 percent crown cover will remain on the site. Some blind lead areas may be used to meet this level. *Type B* clearcuts modify these reserve tree areas by leaving merchantable green tree replacements of specified species and size classes along setting boundaries (Figure 3-11). A maximum of 10 percent crown cover and an estimated 5 percent merchantable volume will be left in the unit. *Type C* clearcuts leave unmer-

chantable trees and snags over the entire unit (Figure 3-12). This treatment will be most applicable to helicopter yarding and a maximum of 15 percent crown cover will be retained. *Type D* clearcuts add islands or fingers of merchantable and unmerchantable reserve trees within the unit, around rock outcrops, behind blind leads and between landings (Figure 3-13). The percent crown cover and the merchantable volume left unharvested will vary depending on the number, size, and volume class of the islands retained. Island size within clearcuts are prescribed for 2 to 5 acres.

Overstory Removal

The overstory removal silvicultural method (referred to as *Type E*) is used when a two-storied stand is present and the understory is healthy and shows good growth potential. An overstory removal involves selecting the larger trees for harvest that comprise the overstory canopy. By removing the overstory, more nutrients and sunlight reach the remaining stand, allowing it to grow to maturity. This method can be designed using strip cuts or patch cuts with the use of appropriate harvesting equipment.

Selection of a particular unit for overstory removal is based on several factors: (1) there should be a distinct two-storied stand component in which the understory is of a submerchantable or small sawtimber size; (2) the topography of the site would not restrict the use of logging equipment necessary for this type of harvesting operation; and (3) there is enough merchantable volume present in the overstory to make the harvesting operation feasible.

Seed Tree

Seed tree cutting is the practice of removing all trees from an area while leaving a few trees standing singly, in small groups, or narrow strips as a source of seed for natural regeneration (referred to as *Type F*).

Silvicultural advantages of the seed tree method (vs. clearcutting) include: (1) better control of species composition and distribution due to a more abundant seed source; (2) can regenerate extensive areas too large to be seeded naturally from adjacent stands; and (3) logging costs are minimal.

Some disadvantages of the seed tree method include: (1) windfirm trees are needed because of an increased risk of blowdown; and (2) it is costly when seed trees are harvested (volume recovery per area), and subsequent damage occurs to the regeneration.

Shelterwood

Shelterwood cutting *(Types G and H)* is the practice of harvesting an area with a series of two or more removals over a period of time to ensure regenerative success. This system provides seed for natural regeneration and protects the seedlings from extreme heat and/or frost conditions. By definition, however, it includes the removal of the trees left for shelter as soon as restocking requirements are met.

Silvicultural advantages of shelterwood harvests include: (1) better control of species composition, and distribution, due to more abundant seed sources; and (2) allows more control over site conditions, such as frost pockets, and therefore regenerative success.

Some disadvantages of the shelterwood method include: (1) increased logging costs due to repeat entry and the care exercised to prevent excessive damage; (2) damage may occur to the

residual stand and reproduction during logging; (3) overstocking of hemlock may occur due to the species shade tolerance; and (4) increased risk of blowdown to the residual stand between entries.

For the Control Lake Project, two levels of shelterwood harvest will be used. *Type G* shelterwoods will leave a minimum of 60 to 80 square feet of Basal Area/acre with 30 percent crown cover (Figure 3-16). Trees retained across the unit will leave an estimated 30 percent of the merchantable volume. *Type H* will leave 80 to 100 square feet of Basal Area/acre and 50 percent crown cover (Figure 3-17). An estimated 50 percent of the merchantable volume will be retained. Most shelterwoods are prescribed within visually sensitive areas to meet partial retention visual quality objectives (Proposed Revised Forest Plan 1991). A minimum of 30 percent crown cover is left to provide the stand with some windthrow protection.

Uneven-Aged System

Uneven-aged systems (referred to as *Type I*) produce stands of high structural diversity because of the intermingling of the different size and age classes. Uneven-aged silvicultural practices include both single tree and group tree selection.

Some advantages of uneven-aged systems include: (1) provides reproduction of shade tolerant species; (2) good seedbed protection with less adverse exposure caused by climate, sunlight or wind; (3) tends to increase diversity due to temporary increases in shade intolerant plants in the small openings.

Some disadvantages of uneven-aged systems include: (1) Sale layout and administration requires highly skilled people; (2) logging costs are usually higher and greater care is required in the logging process due to higher risks of damage to the residual stand; (3) shade tolerant hemlock would eventually replace spruce and cedar species; (4) not suitable for stands infected with dwarf-mistletoe.

Single Tree and Group Selection

Individual tree selection removes selected trees of all age classes on an individual basis distributed throughout the stand. Group tree selection involves the removal of a small group (usually less than 2 acres) of trees in a stand and creates a mosaic of even-aged groups.

Individual tree and small group selection harvest are used to meet silvicultural and/or visual management objectives. Timber harvest can meet Retention VQO guidelines if it is not evident to the casual forest observer. The harvest of individual trees or small groups (less than 2 acres) can be accomplished by helicopter or conventional harvest systems while meeting Retention VQO. Larger group selection harvests (up to 5 to 10 acres) can also meet Retention and Partial Retention VQO by designing the unit shape to fit the form, line, and texture of the surrounding landscape. This can be accomplished by shaping harvest patches in rectangular, linear, or circular patches or by placing them in less visible areas.

Timber Harvest Methods

Timber harvesting is the process by which standing timber is converted into logs and transported to a manufacturing facility where the logs are converted to a higher value product. The harvesting process can be divided into several steps as follows:

- Road Construction—Constructing logging roads needed to harvest the timber. Includes construction of specified roads and construction of temporary roads and landings.
- Fall and Buck—Falling the timber and cutting the felled timber into logs.
- Yard—Moving logs from the stump to a landing or other point of transportation.
- Sort and Load—Sorting the logs by grade (either at a landing or dry sort area) and placing logs on logging trucks.

Figure 3-10

Schematic Diagram of Harvest Type A

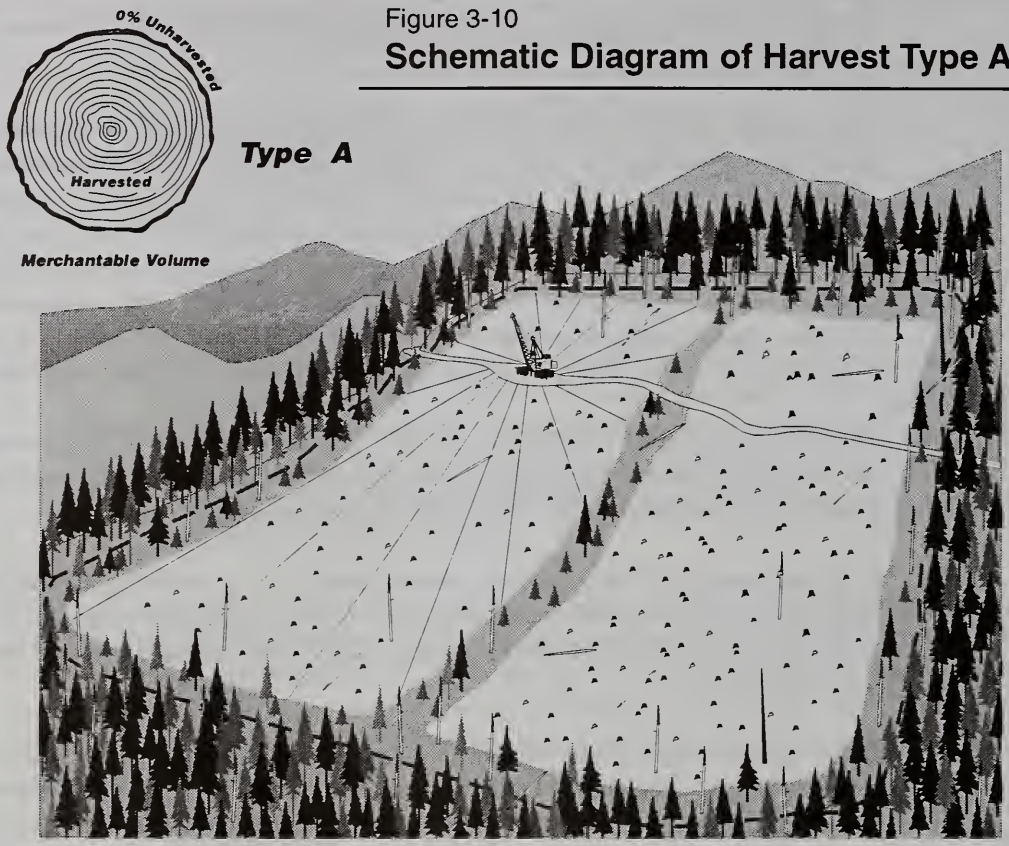


Figure 3-11

Schematic Diagram of Harvest Type B

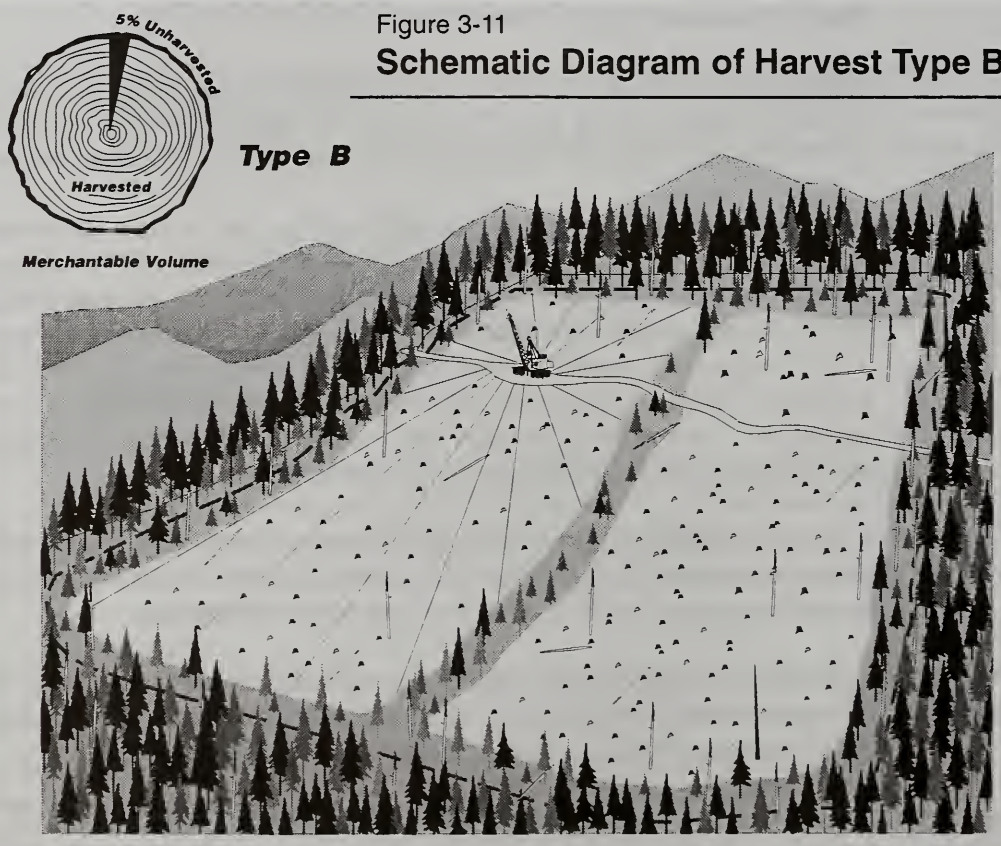


Figure 3-12
Schematic Diagram of Harvest Type C

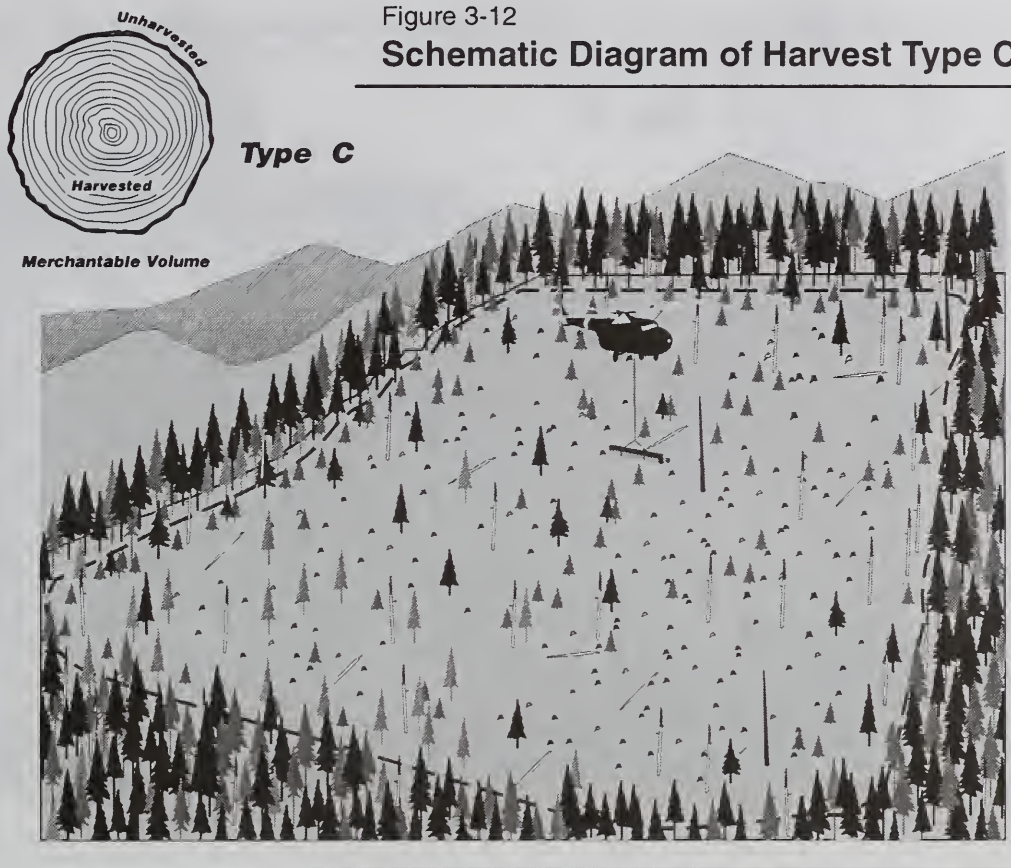


Figure 3-13
Schematic Diagram of Harvest Type D

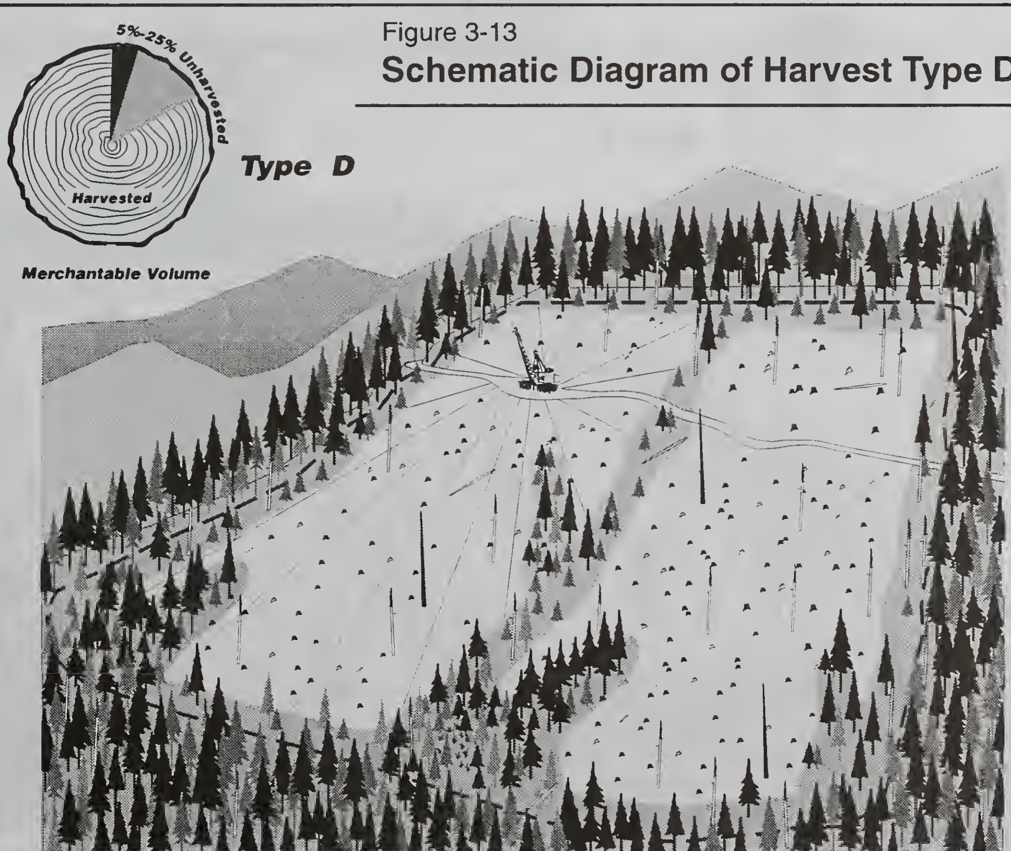


Figure 3-14
Schematic Diagram of Harvest Type E

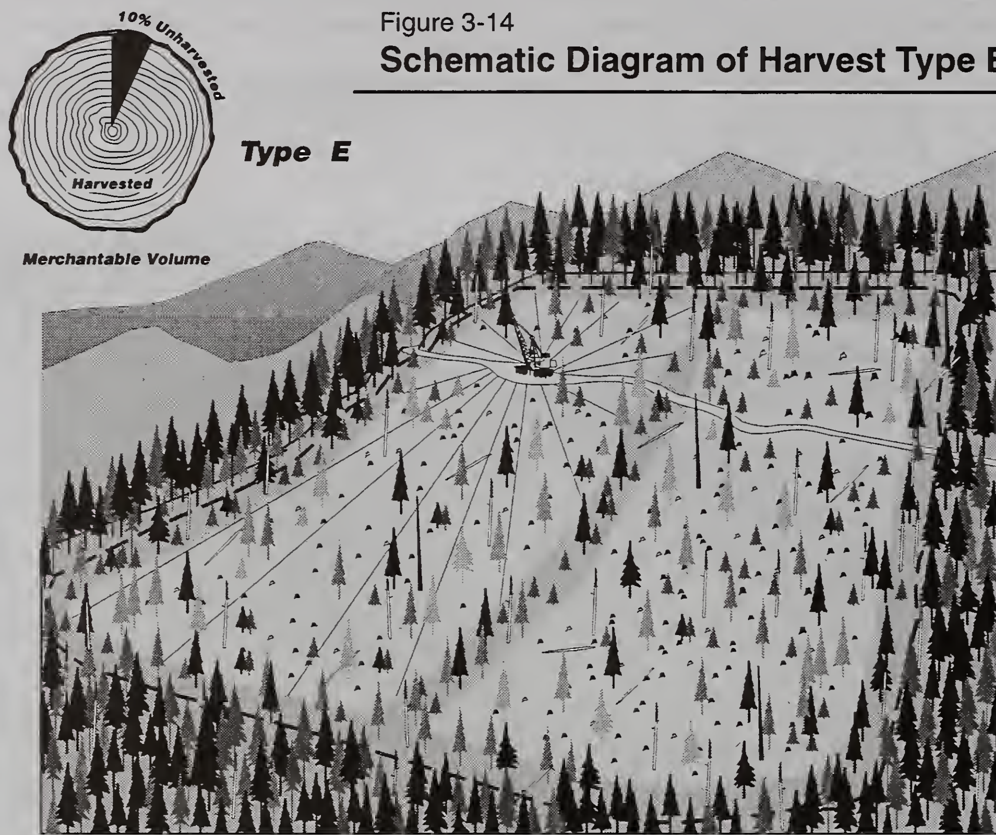


Figure 3-15
Schematic Diagram of Harvest Type F

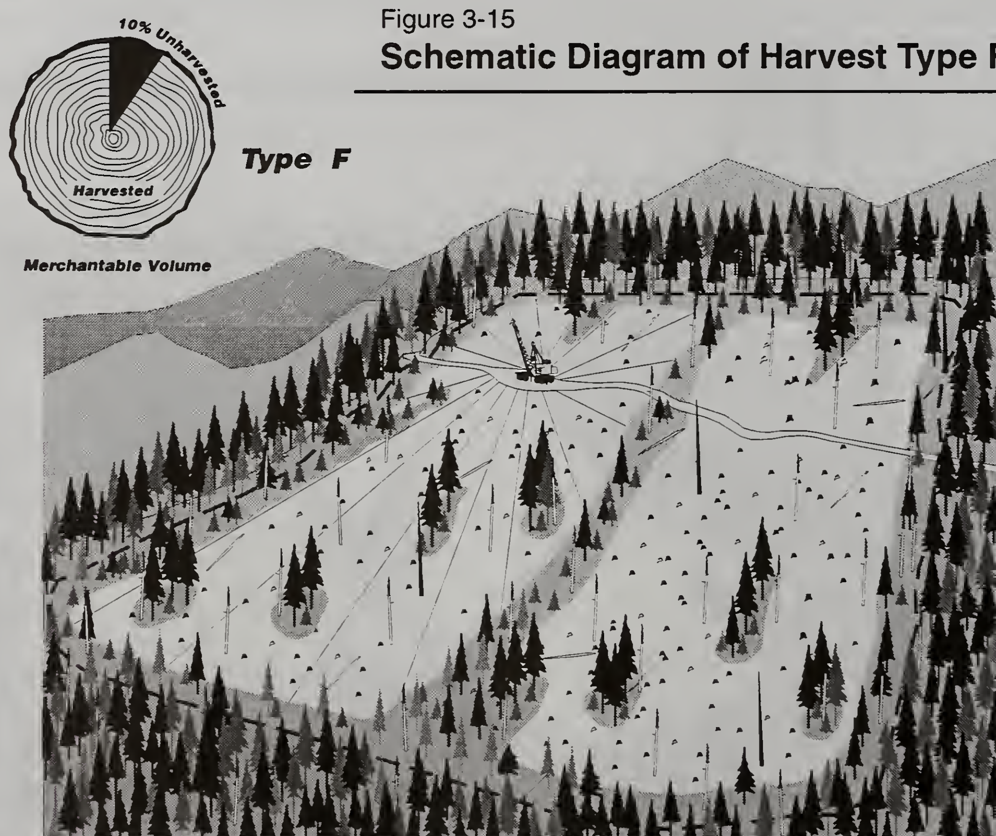


Figure 3-16
Schematic Diagram of Harvest Type G

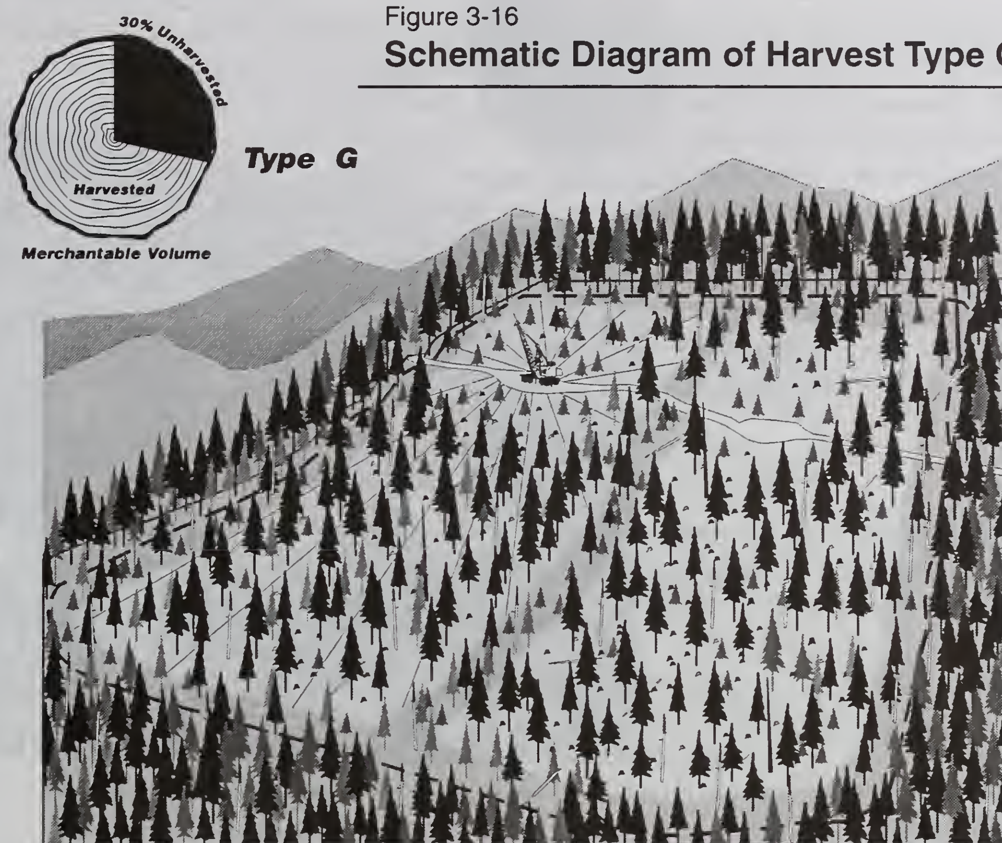


Figure 3-17
Schematic Diagram of Harvest Type H

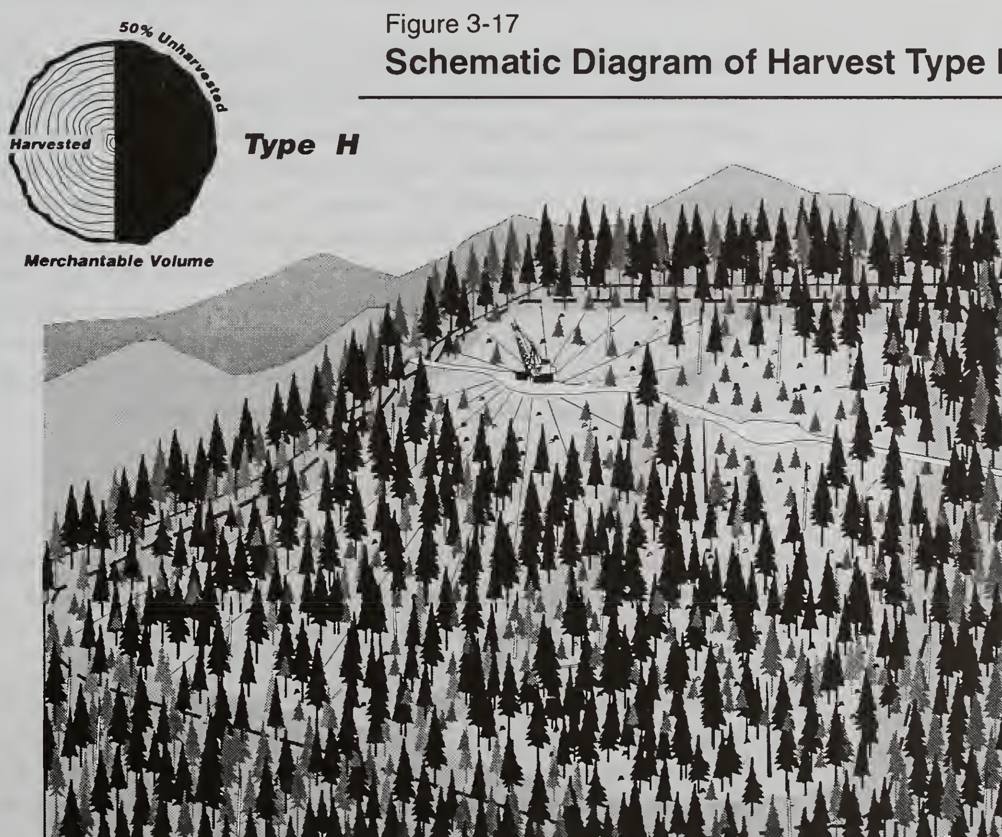
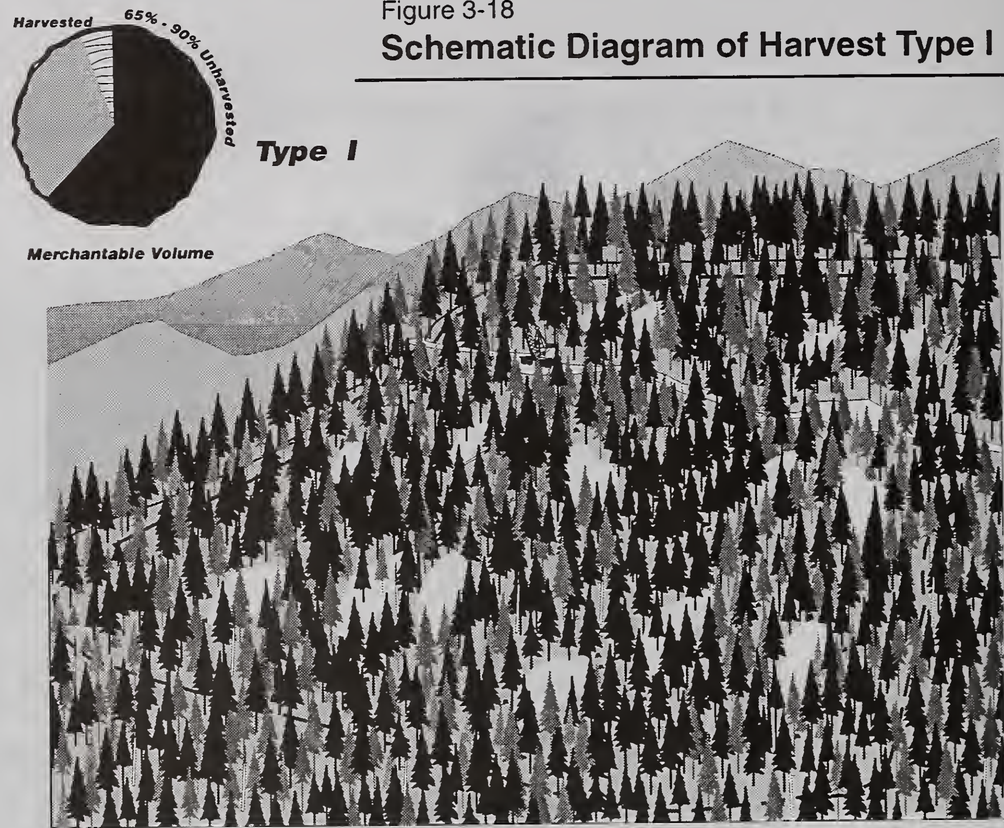


Figure 3-18
Schematic Diagram of Harvest Type I



- Log Haul—Transporting the logs from the landing to an LTF.
- Dump and Raft—Decking, bundling, dumping, and rafting logs into the water at an LTF.
- Log Tow—Towing the logs from the LTF to the manufacturing facility.

Cutting standing trees (felling) can be accomplished with surprising accuracy by a skilled worker (faller). The experienced faller typically uses equipment such as wedges and hydraulic jacks to control the direction of fall and minimize loss caused by breakage and to avoid other resources such as streams, wet areas, and reserve trees. There are no viable options to discuss for the loading and hauling processes. They are part of the overall harvesting operation and will be performed in much the same manner on all units. However, the yarding process offers a variety of opportunities to meet resource objectives through careful design and selection of proper yarding method for the site. Yarding is accomplished using ground-based equipment, cable logging systems, or helicopters. The method used depends upon such factors as topography, resource protection needs, and access. The methods can be broadly categorized into ground-based, cable, or helicopter yarding systems.

Ground-based Yarding Systems

Ground-based systems include tractor and shovel yarding. Tractor yarding, referred to as skidding, includes the full range of surface skidding equipment. Ground-based systems are generally confined to downhill logging on gentle slopes.

Shovel yarding is the process of moving logs from the stump to the landing by repeated swinging with a hydraulic loader. The loader is walked off the haul road and into the harvest unit. Logs are decked progressively closer to the haul road with each pass of the loader until they are finally decked at roadside. For this system to be used effectively, soils should be well drained and side slopes should be less than 20 percent.

Cable Yarding Systems

Cable yarding systems proposed for the Control Lake Project Area include highlead (Figure 3-19), slackline (Figure 3-20), and live and running skyline (Figures 3-21 and 3-22) systems. Highlead and slackline systems can be used to yard logs both uphill and downhill. Skyline systems are used for uphill logging only. Logs yarded by highlead systems are generally dragged on the ground. Some lift to one end of the log is provided by the height of the towers (90-foot towers are commonly used). Where downhill highlead yarding is used, the drag corridors radiate down and toward the landing. There is greater ground disturbance using downhill highlead yarding and water tends to congregate as dredge corridors converge at the landings. Slackline and skyline systems are able to lift one end of the logs or completely suspend the logs, depending on the unit configuration. The impact of yarding on the soil is much reduced using these systems when compared with highlead yarding.

Helicopter Yarding Systems

Helicopter yarding is a system by which logs are moved from the stump to the landing with a helicopter. Total suspension of the logs is achieved resulting in the least impact to the soil. Helicopter yarding is also more expensive than yarding with cable or ground-based systems.

Figure 3-19
Live Skyline Yarding System

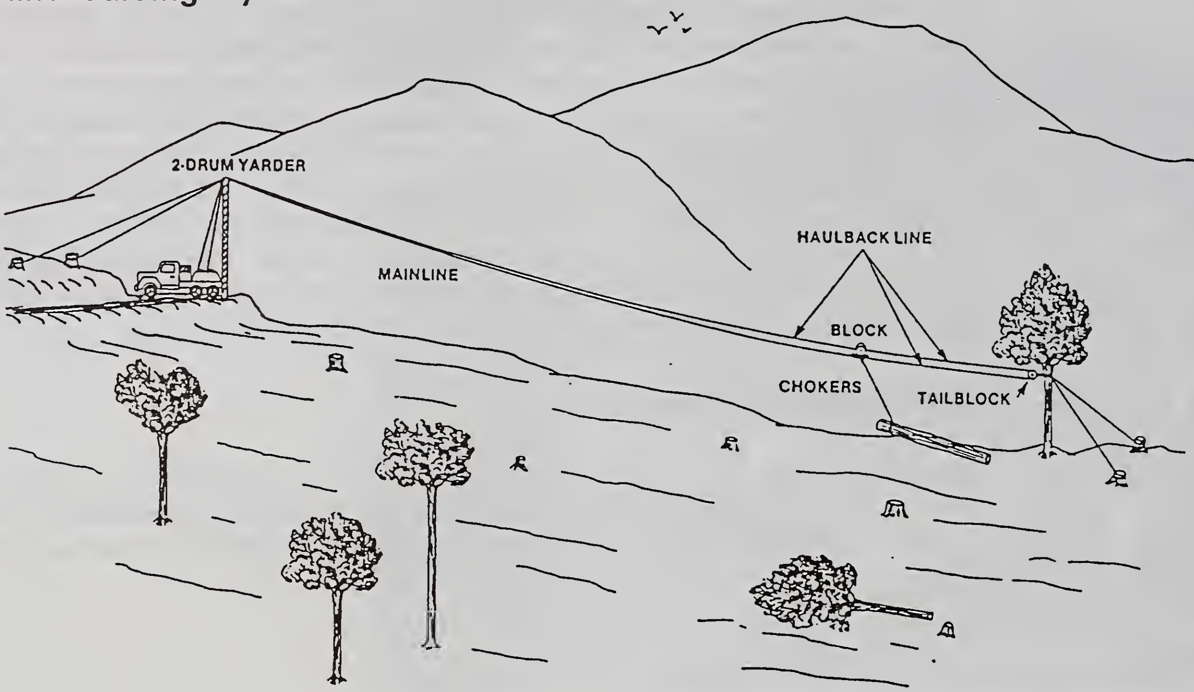


Figure 3-20
Running Skyline Yarding System

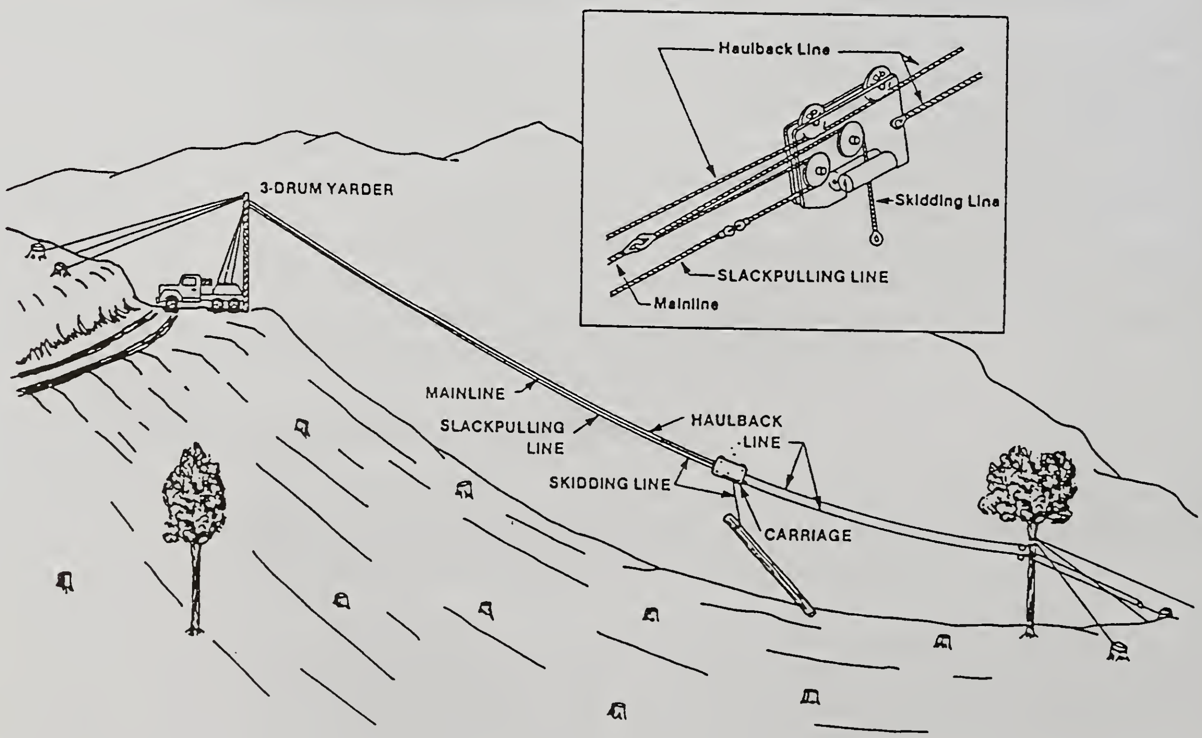


Figure 3-21
Highlead Yarding System

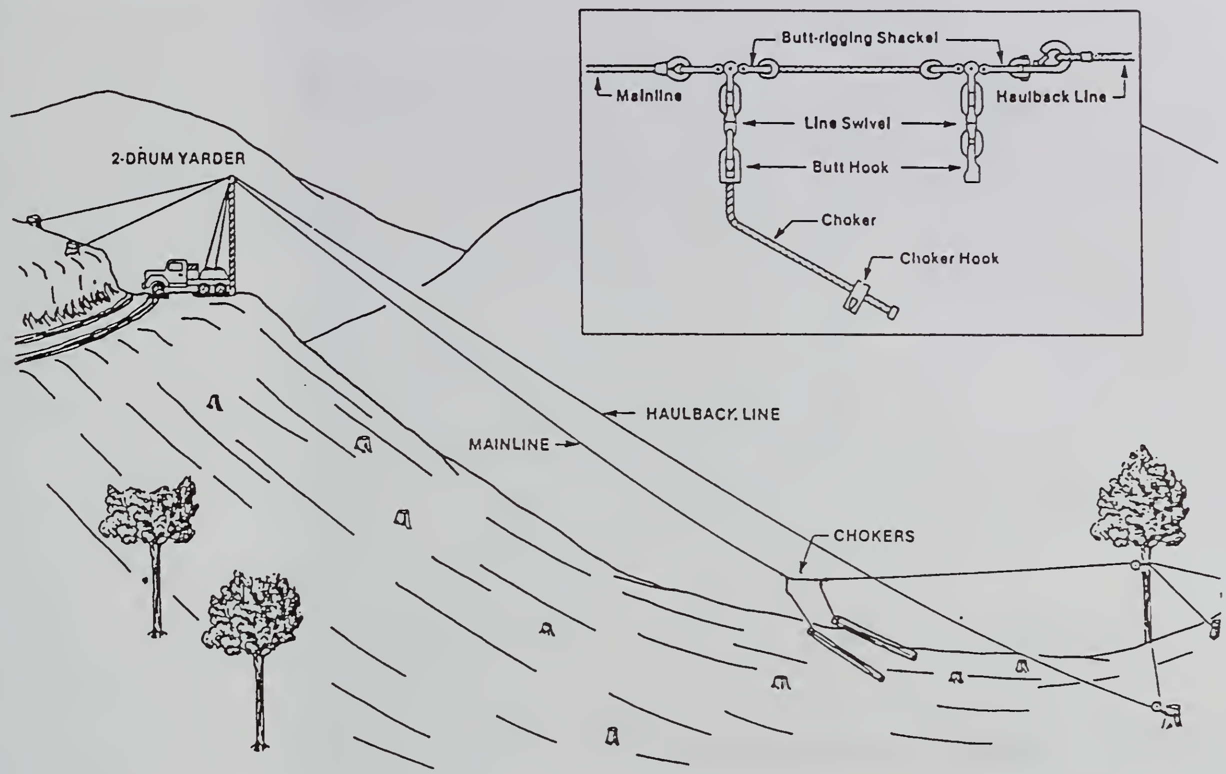
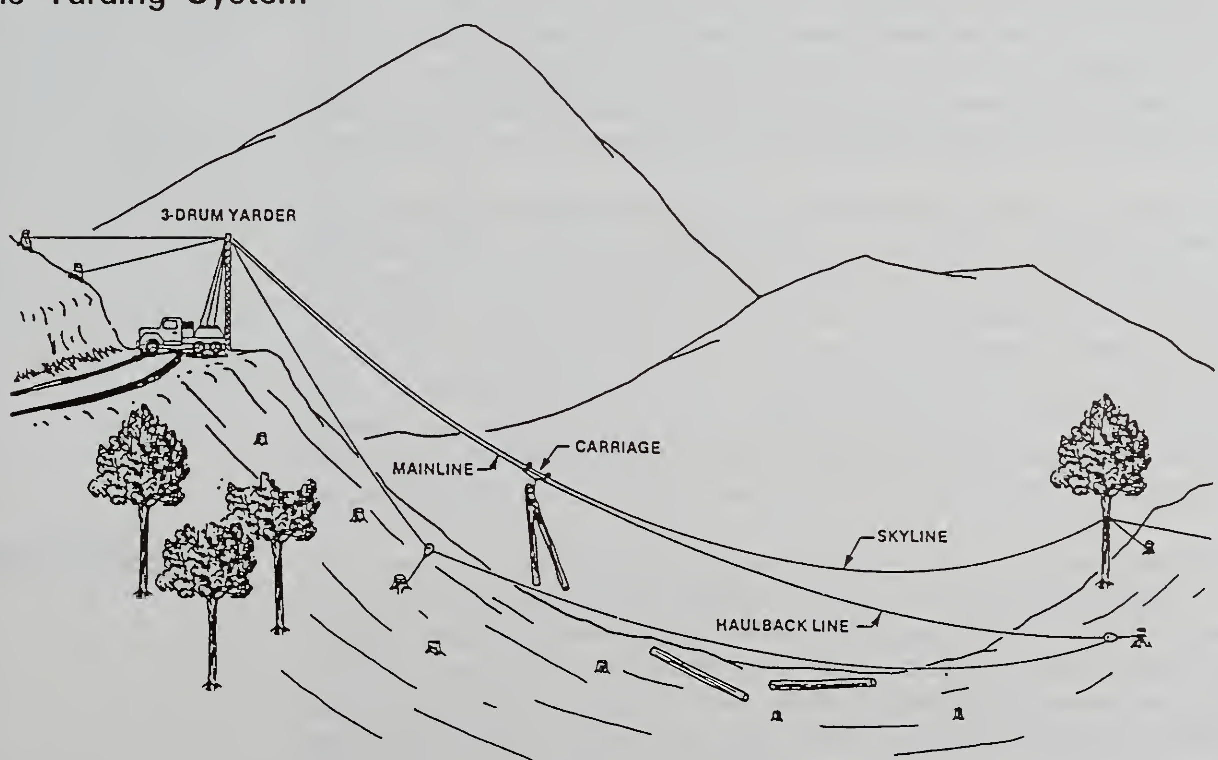


Figure 3-22
Slackline Yarding System



This page left intentionally blank

Wildlife

Key Terms

Carrying capacity—the maximum number of a wildlife species that can be supported in a given area or habitat through the most critical period of the year.
Ecological province—biogeographic areas characterized by similar patterns of species composition, similar distributional patterns of organisms, and a similar geomorphological history.
Habitat—the sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.
Habitat capability—an estimated number of individuals of a species that a habitat can sustain.
Game Management Unit—an Alaska Department of Fish and Game (ADF&G) land division used to regulate the harvest of wildlife species.
Management Indicator Species (MIS)—vertebrate species whose population changes are believed to best serve as an index of a biological community's response to the effects of land management activities or which are important to hunters and trappers.
Viable population—the number of individuals of a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations well distributed throughout their range in the National Forest.
Value Comparison Unit (VCU)—land management units which generally encompass a drainage basin to provide a common set of areas where resource inventories can be conducted and resource interpretations made.
Wildlife Analysis Area (WAA)—division of land identified by the ADF&G and used by the Forest Service for wildlife analysis.

Introduction

The Control Lake Project Area is a mosaic of muskegs, wetlands, alpine meadows, and forest. Before the onset of forest management in the 1950s, forested areas were almost exclusively old growth. Timber harvest has occurred in areas of relatively easy access, such as on the gentler slopes at lower elevations. Traditional timber harvest practices, primarily clearcutting, have resulted in the rapid replacement of multi-storied, old-growth forest stands with young regenerating stands that are structurally and compositionally simpler than the older stands.

The response of wildlife communities to forest succession following timber harvest is complex. Each plant and animal species reacts differently to harvest, with some species benefitting, while others are detrimentally affected. Wildlife species that derive benefits during the early clearcut stage of succession (5 to 25 years) because of an increase in forb and shrub production include black bear, long-tailed vole, and a number of migratory breeding bird species that nest and/or feed in understory vegetation. Species dependent on large, contiguous tracts of old-growth forest, such as marten, Prince of Wales flying squirrel, and Queen Charlotte goshawk, find habitat quantity and quality reduced, as past and future harvests diminish the extent of suitable habitat and the number of travel corridors connecting remaining tracts.

Wildlife Habitats

Habitat refers to the type of environment in which a species occurs. It can be described in terms of elevation, topographic position, or type of vegetation community. A species may occupy a range of different habitats, or more than one distinctive kind of habitat in different seasons. Habitats that occur within the Control Lake Project Area include old-growth forest, second-growth forest, alpine/subalpine, wetland, beach fringe, estuary, and riparian. Many of these habitat types overlap; for example, beach and estuary fringe may include old growth, second-growth forest, and wetland habitats.

This Supplementary Draft EIS presents three analyses to facilitate discussion of wildlife habitats. First, it describes all Project Area forested lands by forest successional stages. Nonforested acres are described as a single category. Next, it presents the nonforested habitats and special wildlife habitats such as riparian and beach fringe. Finally, it provides an analysis of the old-growth forest successional stage. This analysis uses plant series and timber volume class information, and addresses the components of patch size and travel corridors.

The Forest Service Ketchikan Area GIS, Thorne Bay Ranger District, and ADF&G provided the wildlife habitat information used in the analyses. This was updated with site-specific information acquired during the 1993 field inventory. Table 3-20 presents the WAA's and VCU's within the Project Area. The distribution of WAA's in and around the Project Area is shown in Figure 3-23.

The general successional sequence of a stand following clearcut harvest is outlined below. Ages and size classes represented in the stages vary to a certain degree among forest stands since growth and yield depend on factors such as site class, topography, and weather conditions.

Currently Non-stocked (4,178 acres)

Grasses, forbs, shrubs, and conifer and hardwood seedlings flourish for the first 5 years following harvest. Several species of small mammals, including the long-tailed vole, furbearers, and songbirds such as orange-crowned warbler, Wilson's warbler, and Swainson's thrush, use these areas during at least part of their life cycle (Della Sala et al., 1993).

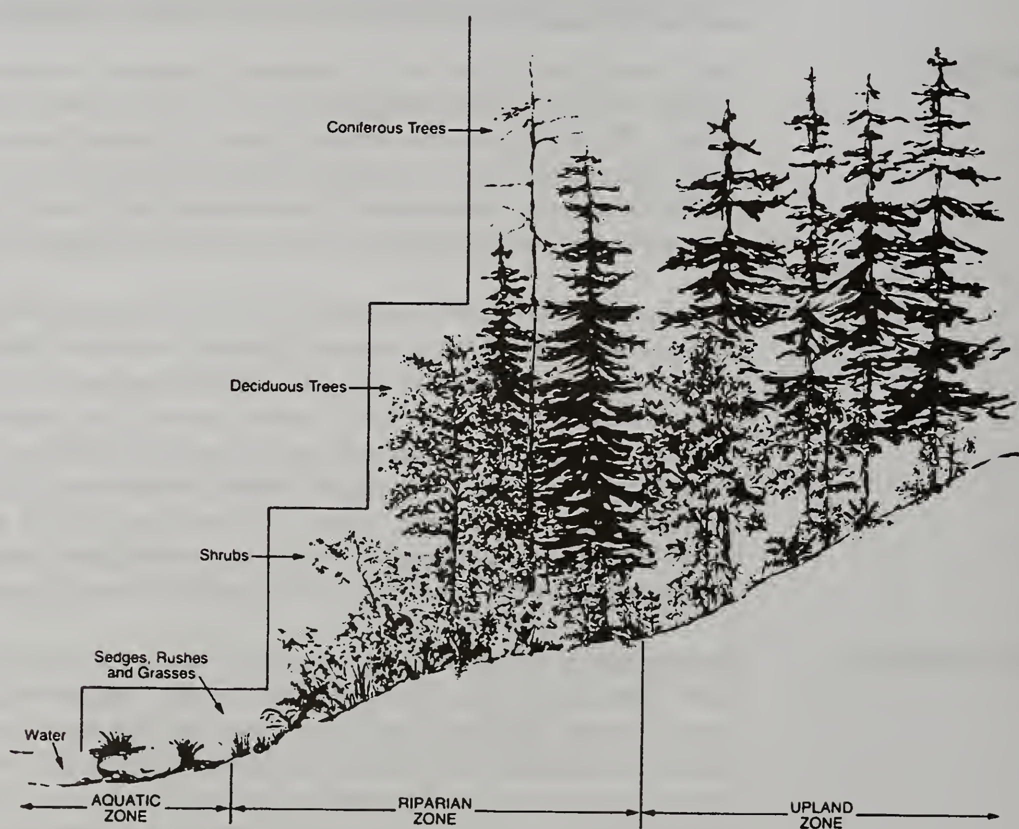


Table 3-20
Project Area WAA's and VCU's

WAA Number	Acreage of WAA in Project Area	Percent of WAA in Project Area	VCU's in WAA
1318	30,800	51	594, 595
1319	76,984	74	575, 576, 578, 596, 597.1, 597.2
1323	34,497	92	591, 592, 593
1421	29,630	33	574, 577

Forest Successional Habitats

Forested habitats mapped on the Ketchikan Area GIS include all areas with at least 10 percent forest cover. Many wildlife species, including those dependent on old growth, use the forested stands within the Project Area. Table 3-21 indicates approximately 79,764 acres of forested habitat exist in the Project Area. Non-forested habitats are described in *Timber and Vegetation*, and, in part, below under Special Wildlife Habitats.

Table 3-21
Successional Stages in Acres, Current Condition (1995)

WAA	Non-Stocked	Seedling/ Sapling	Pole/Young Growth	Old Growth	Non-Forested[1/]
1318	1,289	623	0	13,552	2,542
1319	2,202	2,113	819	37,252	4,362
1323	114	64	114	11,129	3,191
1421	573	772	0	14,226	2,919
Total	4,178	3,572	933	76,159	13,014

1/ The 2,488 acres of lakes in the Project Area are included in these values.

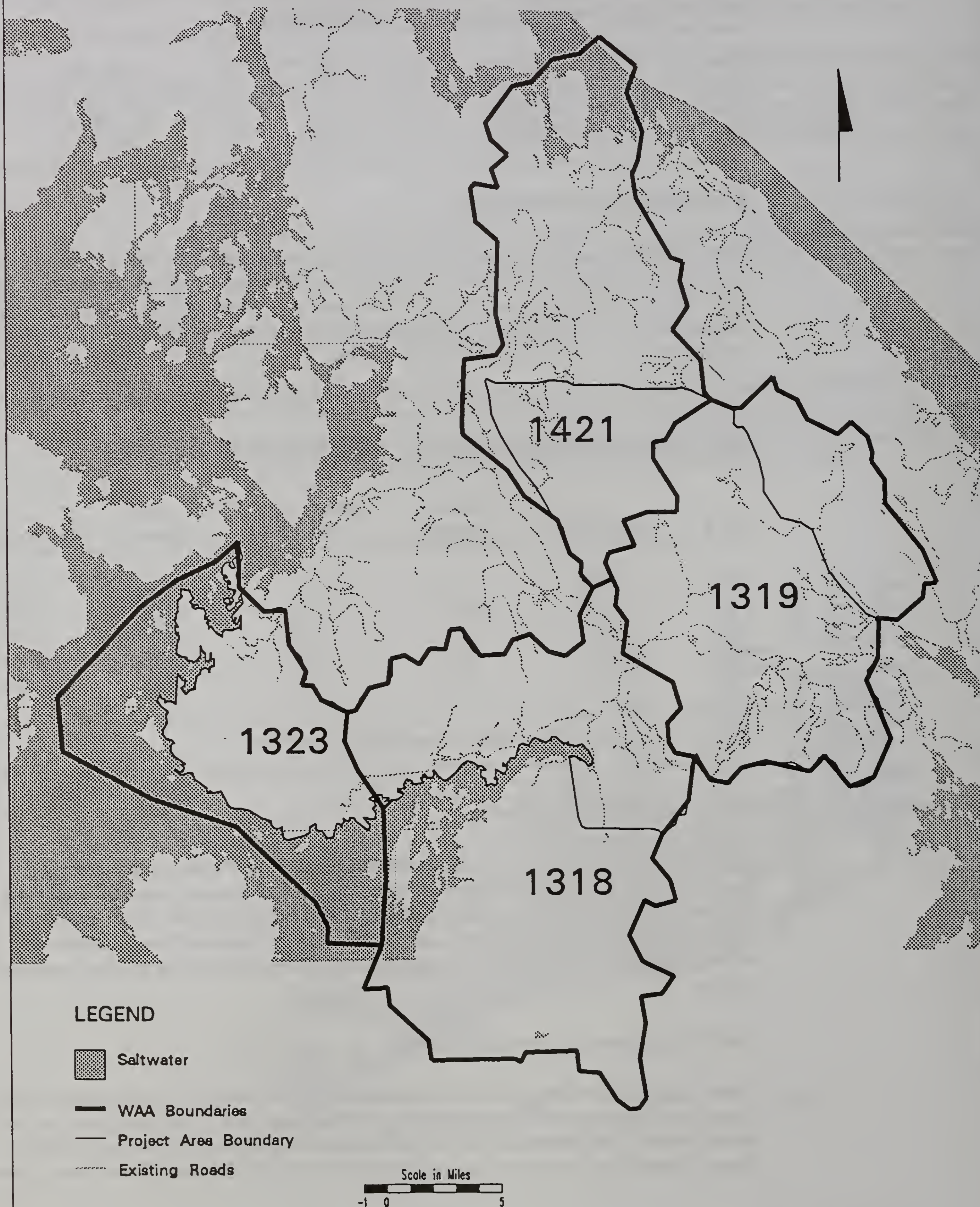
Seedling/Sapling (3,572 acres)

There is an increase in forb and shrub production for the 6- to 25-year period following harvest. A number of wildlife species take advantage of this increase, including black bear, long-tailed vole, and deer (Thomas et al., 1979). Sapling crown closure occurs during this stage. Shade-intolerant grasses, herbs, and shrubs decline because of increased shade from the crown closure of the tree canopy. Conversely, shade-tolerant understory species gradually increase.

Pole/Young-growth Forest (933 acres)

Crown closure is usually complete by 25 years, causing the understory layer to change from a dense shrub, herb, and seedling composition to one of dense moss. The young trees are small, densely stocked, and uniform in size. Large diameter snags and snag-replacement trees are absent, although large-diameter logs may persist for more than 70 years. These stands, which

Figure 3-23
Distribution of WAA's In and Around the Project Area



may persist for more than 75 years (Sigman, 1985), exhibit a poorly developed understory and an even-aged overstory that provides low diversity and low habitat value for wildlife. This stage provides hiding and thermal cover for big game species. Other species, including winter wren, beaver, and mink, also use the cover (Thomas et al., 1979).

Old-growth Forest (76,159 acres)

Approximately 150 years after harvest, an understory of deciduous shrubs, herbs, and conifer seedlings begins to develop in an unmanaged stand (Sigman, 1985). Uneven-aged trees, old-growth overstory structural features, and large-diameter snags with denning cavities begin to develop, becoming more prevalent over the next 2 centuries. Old-growth habitat is characterized as stands of trees well past the age of maturity, with declining growth rates and signs of decadence, such as dead and dying trees, snags, and downed woody material. Many species extensively use these stands including Sitka black-tailed deer, black bear, wolf, marten, Vancouver Canada goose, Queen Charlotte goshawk, bald eagle, Pacific-slope flycatcher, and cavity nesters.

Special Wildlife Habitats

Categories of wildlife habitat in addition to the forested habitats described above are present in the Control Lake Project Area. These special habitat categories are composed of forested and/or nonforested lands and are defined by physical factors including elevation, geology, and topography, as well as by vegetative community. Wildlife species vary in their use of these habitats; some show complete dependence on a single habitat category, while others may use more than one type differentially over the seasons. The special wildlife habitats discussed below include beach fringe and estuary and Riparian Management Areas.

Table 3-22 presents the acres of special habitats under current conditions. These categories overlap with other habitats, including commercial forest land. Thus, acreage totals of these habitats do not reflect the Project Area total acreage.

Table 3-22
Acres of Special Wildlife Habitats Existing Condition (1995)

	Total Acres	Past Harvest
Beach Fringe and Estuary	2,671	118
Riparian Management Areas		
Class I streams	12,745	571
Class II streams	5,531	251
Class III streams	6,501	483
Lakes	2,816	30
Other	6,528	179
Total Riparian Management Areas	33,852	1,521

Beach Fringe and Estuary

The area within 500 feet of the mean high tide was used to define beach fringe habitat. This area is a transition zone between land and water, salt and freshwater, and vegetated and nonvegetated conditions. Forested areas in this zone receive heavy use by species with high economic, recreational, subsistence, or aesthetic values. Black bear, furbearers, bald eagles,

black-tailed deer, shorebirds, and Vancouver Canada goose are species that typically concentrate their activities in the beach fringe forests during some or all seasons. Many of these species exhibit a preference for, or dependence on, old-growth forest stands.

Estuary fringe habitats were defined by a 1,000-foot zone inland from the mean high tide line bordering an estuary. The diverse estuary habitats provide even greater value than beach fringe habitats to wildlife. Black bear, river otters, mink, bald eagles, shorebirds and waterfowl use estuary habitats.

Early timber harvest was concentrated in beach fringe and estuary areas because of the quality of timber and ease of access. Table 3-22 indicates that 2,671 acres of old-growth forest were present within these areas before timber harvest, compared to 2,131 acres currently.

Riparian Management Areas (Riparian LUD)

Riparian habitat is located at the transition from aquatic to terrestrial habitats along rivers, streams, and lakes. It is recognized for its value to a wide variety of species including bald eagles, furbearers, and black bears. Riparian corridors provide travel and migration pathways for numerous species because of the presence of forage, water, and cover. Within the Control Lake Project Area, Riparian Management Areas are defined according to Tongass National Forest standards for the Riparian LUD. The width of the Riparian Management Area varies with the steam/lake class and process group.

Table 3-22 indicates that 33,852 acres of habitat was present within Riparian Management Areas prior to timber harvest. To date, 1,521 of these acres have been harvested. More detailed information on the management of riparian habitat is presented in the section on *Wetlands, Floodplains, and Riparian Areas* section.

Management Indicator Species

MIS are animals whose population changes are believed to indicate the effects of land management activities generally on wildlife populations (USDA Forest Service, 1982). The concept of MIS was developed to promote more effective management of wildlife and fish habitats on National Forest System lands. MIS have been selected and management requirements identified for wildlife species within the region to ensure that adequate habitat exists to maintain population viability and biological diversity, and to establish management goals for species in public demand.

Although red squirrel, mountain goat, and brown bear were selected as Tongass National Forest MIS, they were not selected as MIS for the Control Lake Project since they do not occur within the Project Area. Table 3-23 presents the species that will serve as MIS for this project.

Habitat capability models developed by interagency task groups (TLMP Draft Revision, 1991a) were used to characterize existing conditions and effects of proposed land management activities on MIS. Habitat capability models are not intended to predict population levels or set bag limits. Their use is intended to give a relative comparison between alternatives of the effects on habitat.

Table 3-24 presents the results of the MIS analyses for current conditions (1995) expressed as a percentage of the 1954 (prior to commercial harvest) capability.

Table 3-23
Management Indicator Species for the Project Area

MANAGEMENT INDICATOR SPECIES (MIS)—Wildlife

Black Bear

Marten

River Otter

Gray Wolf

Sitka Black-tailed Deer

Vancouver Canada Goose

Bald Eagle

Red-breasted Sapsucker

Hairy Woodpecker

Brown Creeper

Species	Rationale for the Selection
Sitka black-tailed deer	Represents species using low elevation old-growth forest habitats during the winter; important game species
Black bear	Represents species using estuarine habitat; game species
Wolf	Predator tied to a specific prey base
River otter	Represents species using riparian habitat; furbearer
Marten	Low elevation old-growth winter habitat; important furbearer
Vancouver Canada goose	Represents species using riparian habitat; game species
Bald eagle	Old-growth coastline; high public interest
Red-breasted sapsucker	Cavity excavator using low-volume old growth
Hairy woodpecker	Cavity excavator using high-volume old growth
Brown creeper	Represents species using large, high-volume old-growth

Source: USDA Forest Service 1982

Table 3-24
Estimated MIS Habitat Capabilities for 1995 Expressed as a Percentage of 1954 Habitat Capabilities

Species	1995 Habitat Capability (%)	Change from 1954 (%)
Black-tailed Deer1/	91	-9
Black Bear2/	82	-18
Wolf1/	91	-9
Marten1/	89	-11
River Otter	93	-7
Bald Eagle	96	-4
Vancouver Canada Goose	93	-7
Red-breasted Sapsucker1/	93	-7
Hairy Woodpecker1/	73	-27
Brown Creeper1/	58	-42

1/ Includes patch-size effectiveness reduction factor (see *Biodiversity* section).

2/ Includes disturbance reduction factor to account for disturbance to black bears associated with roads.

The TLMP Revision (1997) discontinues use of habitat capability models, with the exception of a modified deer model. Analysis of the modified deer model for Project Area WAA's (TLMP, 1997) shows a substantial decrease in habitat capability between 1954 and 1995. This downward trend is similar to the decrease estimated for the Project Area using the TLMP Draft Revision (1991a) model, as shown in Table 3-24. For other MIS, the TLMP Revision (1997) incorporates species assessments prepared by expert panels to document expected effects of the implementation of the Forest Plan. Although the assessments were prepared on a Forest-wide, rather than project-specific basis, they predict effects that are consistent with those described in this Supplemental Draft EIS for the Control Lake Project Area.

Sitka Black-tailed Deer

Sitka black-tailed deer (*Odocoileus hemionus*) is considered a generalist species that ranges through all major habitats on Prince of Wales Island. As an MIS, black-tailed deer represent other species that use lower elevation old-growth forest habitats during the winter.

Winter snow conditions affect deer populations through decreased forage availability, specifically in clearcut areas, and increased energy expenditures. The highest quality winter range exists on south-facing slopes below 800 feet in elevation, dominated by high volume old-growth stands. During periodic accumulations of snow, old growth-forest patches provide "optimal thermal cover" (Witmer et al., 1985). The combination of a dense canopy with

scattered openings allows forage growth in the openings, while the canopy modifies snowfall sufficiently to promote availability of forage and movement of deer. Early successional stands provide forage for deer during mild winters and the remaining seasons.

Old-growth patches of 1,000 acres or larger are believed to provide optimum deer habitat. Deer winter range fragmented into isolated islands of old growth concentrates deer in predictable areas, offering far less security from wolves by reducing predator search time (USDA Forest Service, 1991a).

During the 1993 Control Lake field inventory, biologists documented deer sightings and signs throughout the Project Area. These included deer sightings, scat, tracks, browse, beds, and travel corridors. High quality deer wintering areas were identified along the majority of the coastal shoreline and estuaries, around most of the lakes, and in the Drumlin area of the Honker Divide Watershed.

The Project Team used the habitat capability model (TLMP, 1991a) to evaluate high quality deer winter range, assumed to be the most limiting factor for Sitka black-tailed deer populations. The Project Team found that, when combined with winter range habitat identified by the Thorne Bay Ranger District, high quality habitat was most concentrated on the Western Peninsula and in the Honker watershed of the Control Lake Project Area. The Western Peninsula contains a high degree of natural fragmentation, with productive timber concentrated along the shoreline and stream corridors. This may result in greater sensitivity of this area to human-caused fragmentation. Currently, high quality deer winter range represents approximately 13 percent (22,980 acres) of the Project Area. Approximately 3,160 acres have been harvested since 1954. However, 55 percent of the Project Area now lies within non-development LUD's under the new Forest Plan (1997) and will be protected from future timber harvest.

Results of the deer model indicate a 9 percent reduction in habitat capability since the start of the KPC contract in 1954 (Table 3-24). Both the TLMP Draft Revision (1991a) deer model and the TLMP Revision (1997) deer model were used to evaluate timber harvest proposed under the Lab Bay Sale (USDA Forest Service, 1997), which is just north of the Control Lake Project Area. Both models showed decreasing habitat capability between 1954 and current conditions, with the 1997 model showing a decrease about three times greater than the 1991 model. Based on this project-specific analysis, it is expected that use of the 1997 deer model for the Control Lake Project would result in the same general trends of habitat capability reduction, with a larger effect relative to the pre-harvest (1954) condition.

No roads existed in the Project Area prior to 1954. Today, road density is 0.78 mile per square mile. Road construction affects black-tailed deer habitat by displacing deer from preferred habitats, and increasing deer harvest opportunities in localized areas adjacent to roads (see *Subsistence* section). This is of particular concern when forest canopy cover adjacent to roads is limited (Thomas et al., 1979; Washington Department of Wildlife, 1987).

Black Bear

Black bears (*Ursus americanus*) range through all major habitat types found in the Project Area. They require large expanses of habitat, as well as protection from human disturbance. The availability of food and cover are the primary influences on the movements and distribution of black bears. Estuarine, riparian, and coastal habitats receive the highest use by black bears. Although many of their preferred plant foods grow in openings, bears prefer not to move very far from cover while foraging; therefore, they do not use large openings without cover (Suring et al., 1992).

The availability of den sites is also a critical determinant of habitat quality for bears. The characteristics of preferred sites in Southeast Alaska (e.g., hollow logs and trees, and a well-developed understory) are typically associated with old-growth forests (Suring et al., 1992).

Increased road densities, with accompanying increases in human access to areas, might negatively affect black bear populations, which are susceptible to overharvesting (Kolenosky and Strathearn, 1987). Road construction increases the chances of human disturbance which might result in the displacement of animals from their preferred habitats.

Bear sightings and signs were commonly observed throughout the Project Area during the 1993 field season. Dens were located in old-growth stands throughout the Project Area. The areas surrounding most of the bays within the Project Area provide important black bear habitat.

The black bear habitat capability model indicates an 18 percent decline from the pre-1954 level (Table 3-24). Black bear habitat currently represents approximately 60 percent of the Project Area.

Wolf

Wolves (*Canis lupus*) are wide ranging, opportunistic predators (Paradiso and Nowak, 1982). The presence of wolves in an area, appears to be dictated primarily by the availability of habitat for its prey species (Carbyn, 1987) and the intensity of human-caused mortality (Mech et al., 1988; Mech, 1995). The wolf has adapted to a carnivorous diet made up mainly of large ungulates or beaver (*Castor canadensis*) and, when available, spawning salmon. Availability of suitable denning habitat is of secondary importance to wolves. In forested areas, dens are usually located on elevated knolls within 1,600 feet of water (Carbyn, 1987). Dens located on Prince of Wales Island have been in old-growth stands within 100 meters of freshwater (Person and Ingle, 1995).

Timber harvest and the construction of road systems on Prince of Wales Island has altered the habitat of wolves and their prey. The primary effect of high road densities is the increased accessibility to wolves they afford hunters. Wolves are reportedly intolerant of open road densities that exceed a 1.0 mile per square mile threshold, raising the concern of maintaining viable populations (Mech, 1989; Fuller, 1989; Mech et al., 1988; and Thiel, 1985). Suring et al. (1992) recommends that road densities be maintained below this level within each WAA. Additionally, sufficient habitat should be maintained to support at least five deer per square mile in areas where deer are the primary prey species. All WAA's are currently below the 1.0 mile per square mile threshold. The 44 miles of shoreline within WAA 1323 provide additional access to the Western Peninsula for hunters and trappers. Although miles of shoreline are not included in road density calculation, the effects of shoreline access are considered in the development of access management plans.

The USFWS was petitioned to list the Alexander Archipelago wolf as threatened under the Endangered Species Act. The petition was based on several factors: present and threatened destruction, modification, and curtailment of habitat from the reduction and long-term degradation of habitat for Sitka black-tailed deer by clearcut logging; inadequate regulation of road access leading to increased shooting and trapping of wolves; and, other factors including inbreeding within insular populations that may reduce genetic fitness, adaptability, and long-term viability (USDI Fish and Wildlife Service, 1994). The USFWS undertook a status review of the Alexander Archipelago wolf and found that listing was not warranted at this time (USDI Fish and Wildlife Service, 1995). The wolf is considered a species of concern (formerly called a Category 2 Candidate species) on the Tongass National Forest.

A study is currently underway on north-central Prince of Wales and the adjacent islands to determine distribution and abundance, home range, movements, habitat use, and the feeding ecology of the wolf. Information to date indicates that within Game Management Unit 2 (GMU-2), only Prince of Wales Island is sufficiently large to maintain a permanent wolf population in the absence of immigration from some other source. Average pack home range size for wolves on Prince of Wales Island is 264 square kilometers. This appears to be larger than home ranges reported for wolf packs in other studies where the primary prey is deer. An analysis of habitat use vs. availability for three packs, based on radio locations, showed that the wolves selected highly productive forest (volume classes 5, 6, and 7) habitat, particularly in the winter. Two packs used low-volume stands more than expected and one pack used noncommercial habitat more than expected. All three packs used second-growth habitat significantly less than expected (Person and Ingle, 1995).

During the 1993 Control Lake field reconnaissance, the majority of the sightings and signs were observed in the Honker Block, Rio Roberts Watershed, Logjam Watershed, and the Western Peninsula Area. The areas surrounding the majority of the bays provide important wolf habitat.

Habitat capability model results for wolves are proportional to results for Sitka black-tailed deer. The model indicates a 9 percent decline from the pre-harvest level (Table 3-24).

Marten

Marten (*Martes americana*) prefer mature and old-growth forest and are closely associated with overmature stands with a canopy closure greater than 40 percent. The abundance of the shrub and forb layer in a typical old-growth stand, in conjunction with the structural diversity of its understory, supports a variety of small mammal prey species. Downfall, stumps or slash provide access routes allowing marten to hunt below deep snow. Overstory cover provides marten with protection from potential bird predators. The fallen logs, decadent trees, and large snags in old-growth forests provide resting and den sites for marten (Suring et al., 1992; Strickland and Douglas, 1987).

Marten represent a species group that uses lower elevation old-growth forest habitats during the winter period. Although forest management activities resulting in easier human access will increase potential for overtrapping, the quantity and quality of winter habitat is considered the most limiting factor for marten in Southeast Alaska. High quality winter range includes old-growth stands in coastal habitats (beach fringe and estuary) and riparian areas, as well as upland habitats below 1,500 feet in elevation. Optimum use of habitat occurs when patches of preferred habitat are greater than 180 acres, and use declines with decreasing patchsize, becoming zero when patches of preferred habitat are less that 10 acres (TLMP, 1991a).

Marten are easily trapped and are susceptible to overharvest. Road construction reduces cover and increases human access, thereby increasing trapping vulnerability, particularly when located within marten travel corridors (ridges, saddles, and riparian areas) and foraging areas (Warren, 1990). During the 1993 field reconnaissance, marten sign and sightings were documented along the Thorne River and Rio Beaver Creek, and on the Western Peninsula.

The large patches of high quality marten habitat (400 to 5,000-acre blocks of unfragmented habitat) are located primarily within the Honker Block, Upper Cutthroat watershed, Big Salt Block, Goshawk Block, and along Elevenmile Creek and the Western Shore Corridor. The majority of this habitat is associated with riparian and coastal habitats.

Currently, the unmodified and near-natural environment LUD's provide approximately 45 percent of the high quality marten habitat in the Project Area. Approximately 12 percent of the total high quality habitat has been harvested since 1954.

The habitat capability model indicates an 11 percent decline from the pre-1954 level (Table 3-24).

The TLMP Revision (1997) includes a Forest-wide program to conserve and provide habitat to assist in maintaining long-term sustainable marten populations. The new standards and guidelines include special features for protection of high quality marten habitat in higher risk biogeographic provinces. These provinces are defined as regions where significant amounts of past timber harvest has resulted in young conifer stands with little or no residual forest structure. The Control Lake Project Area is located within one of the high risk provinces, and

contains two VCU's (577 and 597) that approach 33 percent previous harvest threshold. As specified in the ROD, for the TLMP Revision (1997), the new marten standards and guidelines will be implemented on the Control Lake Project Area as determined by an interagency implementation team consisting of NMFS, EPA, USFWS, ADF&G, and other pertinent state agencies.

River Otter

River otters (*Lutra canadensis*) are associated with both coastal and freshwater aquatic environments and the immediately adjacent (100 to 500 feet) upland habitats. High quality habitat occurs along the coast (beach fringe) and within riparian habitats along rivers, streams, and lakes up to 1,200 feet in elevation. Lakes larger than 50 acres provide optimum foraging opportunities. The primary food source of otters is fish, plus a minor component of marine invertebrates (Larsen, 1984). Several otter dens were found along the San Cristoval coastline within the Western Peninsula during the 1993 field inventory.

High quality habitat consists primarily of low-volume, old-growth stands situated along the shoreline of salt water, large lakes (larger than 50 acres), and Class I and II riparian areas. River otter habitat (97 percent) is almost exclusively located within unmodified and near-natural environment LUD's. Specific locations of high quality habitat include the upper Honker Block along its northeast edge near the Baird Corridor, and northeast of Twin Lakes. Habitat is also found along either side of Thorne River in the lower portion of VCU 575, along Snakey Creek, within the Rio Roberts Corridor, and on the Western Peninsula. High-quality habitat has been reduced by 5 percent since the pre-harvest period (prior to 1954).

The model indicates a 7 percent decline from the pre-1954 level. Current otter habitat represents approximately 5 percent of the Project Area.

Bald eagle

Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) in Southeast Alaska prefer to nest adjacent to the coast where they forage for fish, waterbirds, marine invertebrates, and drifting carrion. Nests are typically located in old-growth coniferous forests along the coastline and associated saltwater inlets. Nest surveys conducted by the Forest Service and the USFWS, as well as the 1993 Control Lake field reconnaissance, documented a total of 35 nests along the Project Area coastline and inland along the Thorne River, Elevenmile Creek, Rio Roberts, and Cutthroat Creek. In addition, 7 nests are located at the perimeters of Thorne Lake, Big Island Lake, and Balls Lake. The majority of nests in the Control Lake Project Area are within the no-harvest Beach Fringe and Estuary LUD or the no-harvest portion of the Stream and Lake Protection LUD.

Table 3-25 shows the number of inventoried eagle nest trees, by WAA, for the Control Lake Project Area. The number of nest sites displayed in the table does not reflect 11 nests situated on private land within the project boundary.

Table 3-25
Bald Eagle Nest Sites in the Control Lake Project Area on National Forest System Lands

WAA	Number of Nests
1318	0
1319	16
1323	26
1421	0
Total Nests	42

The bald eagle habitat capability model is designed to evaluate nesting habitat based on geographical location, elevation, stream class, lake size, habitat type, and volume class. The largest and highest quality patches are found on the Western Peninsula of the Project Area on Blanquizal Point and along the Nossuk Bay Peninsula.

The model indicates there are approximately 3,460 acres of high quality nesting habitat in the Project Area (Table 3-24). This is a 4 percent decline in habitat capability from 1954.

Vancouver Canada Goose

The Vancouver Canada goose (*Branta canadensis fulva*) is a relatively nonmigratory species. They are unique among all subspecies of Canada geese in that they use forested habitat for nesting and brood-rearing (Lebeda and Ratti, 1983). High-quality nesting and brood-rearing habitat is generally associated with low volume old growth on poorly drained soils, adjacent to small wetlands, lakes, and riparian areas. Beach fringe and estuary areas are high-quality habitats for Vancouver Canada geese.

Hansen (1962) indicated that nesting and brood-rearing is probably the most limiting habitat factor. For this reason, and because of the potential for effects from forest management activities, the goose model evaluates nesting and brood-rearing habitat capability on the basis of vegetation, location, and proximity to roads.

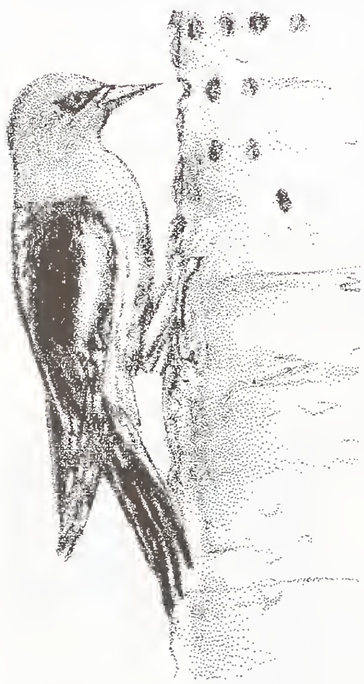
The largest patch of high quality Vancouver Canada goose habitat is in the northernmost portion of the Project Area, overlapping the Logjam Creek watershed and Honker Block. The remaining high quality habitat consists of moderate-sized patches scattered throughout the Control Lake Project Area.

The Project Team documented the Canada goose use throughout the Project Area during the 1993 field season. Sightings and sign observed by the team were often along the shoreline of lakes and ponds, as well as in muskegs. Model results indicate there are approximately 31,420 acres of high quality nesting and brood rearing habitat within the Project Area. This is a 7 percent decline from the pre-1954 level (Table 3-24). Current high-quality goose habitat represents approximately 18 percent of the Project Area.

Red-breasted Sapsucker

The red-breasted sapsucker (*Sphyrapicus ruber*) represents the group of cavity-excavating and cavity-using species requiring old-growth habitat.

The size of red-breasted sapsucker populations in an area is directly related to the quantity of snags. Nest trees range from 10 to 32 inches dbh; although sapsuckers use smaller diameter trees, productivity appears to increase when larger diameter trees are available. Forest stands over 2,000 feet in elevation are not considered valuable as habitat for red-breasted sapsuckers. Highest levels of use occur when patches of old growth are larger than 250 acres; use declines to zero when patches of preferred habitat are smaller than 5 acres (Suring et al., 1993).



The red-breasted sapsucker model evaluates breeding habitat capability based on habitat type and volume class. Results of this model indicate that high quality sapsucker habitat is extensive, occurring throughout the Project Area and encompassing all old-growth habitat (Volume Classes 4 to 7) below 2,000 feet in elevation. High quality habitat is concentrated primarily in the Honker Divide and north of Big Salt Lake. Habitat patches on the Western Peninsula are relatively small and more distant from each other, corresponding with the naturally fragmented landscape within this area.

The model results show that 69,460 acres of high quality habitat remain within the Project Area. This is a 7 percent decline in habitat capability from the pre-1954 level (Table 3-24). Currently, the unmodified and near-natural environmental LUD's provide approximately 43 percent of the high-quality habitat that exists within the Project Area.

Hairy Woodpecker

Although hairy woodpeckers (*Picoides villosus*) are listed as uncommon residents throughout Southeast Alaska, the Project Team observed sightings and sign on numerous occasions within the Project Area. These primary cavity excavators require old-growth forest habitats with snags and partially dead trees for foraging and nesting. Optimum use occurs when patches of preferred habitat are larger than 500 acres. Use declines to zero when patches are smaller than 10 acres (TLMP, 1991a).

Winter roosting and foraging habitat are considered to be the limiting factor for resident cavity-nesting birds (Raphael and White, 1984). Habitats used during the winter are below elevation 1,500 feet and are characterized by a high, dense canopy cover provided by large, widely spaced trees.

The winter habitat capability model indicates that high-quality habitat for the hairy woodpecker is scattered throughout the Project Area and closely follows old-growth forest distribution. It is concentrated primarily in the Honker Divide and above Big Salt Lake. Currently, the unmodified and near-natural environment LUD's provide approximately 47 percent of the high-quality habitat that exists within the Project Area.

Model results show 57 percent of old-growth forest within the Control Lake Project Area as suitable for the hairy woodpecker. Approximately 43,740 acres of high-quality habitat remains within the Project Area. Model results indicate a 27 percent decline in habitat capability from the pre-1954 level (Table 3-24). The unmodified and near-natural environment LUD's provide 47 percent of the high-quality habitat that currently exists within the Project Area.

Brown Creeper

The brown creeper (*Certhia americana*) forages almost exclusively on the trunks of trees in conifer forests (Morse, 1970). They represent species dependent on high volume old-growth; for brown creepers, the tree size is more important than the tree species. Large-diameter trees allow the birds to feed longer and capture more beetle larvae (their primary prey) per visit, as well as reducing their exposure during cold, windy weather.

Studies suggest that winter habitat is the limiting factor for cavity-nesting birds, including the brown creeper (Raphael and White, 1984). Old-growth conifer stands below elevation 1,500 feet, and greater than 20,000 BF per acre, are the preferred habitat. Optimum use occurs when high-volume old-growth patches are larger than 15 acres, and use declines to zero when patches are smaller than one acre (Suring et al., 1993).

During the 1993 field inventory, brown creeper observations were documented along the Thorne River and within the Rio Beaver Block and Rio Roberts Corridor.

The brown creeper model evaluates the capability of winter habitat based on successional stage and volume class. Model results indicate a 42 percent decline in habitat capability from the pre-1954 level (Table 3-24). Current brown creeper habitat represents approximately 9 percent of the Project Area. Specifically, high-quality habitat is concentrated in the Honker Corridor, the upper Cutthroat Lakes Area, and the Big Salt Block. Currently, the unmodified and near-natural environment LUD's provide approximately 30 percent of the high-quality habitat that exists within the Project Area.

Snag Density by Watershed

Maintenance of a minimum of 275 snags per 100 acres of forested habitat, averaged on a fourth-order watershed basis, is expected to maintain viable cavity excavator (e.g., hairy woodpecker and red-breasted sapsucker) populations throughout individual fourth order watersheds as timber management activities cause fluctuations in the amount of forested acreage and, thus, snag densities.

The Project Team conducted snag density surveys within the Project Area to provide more specific data on the composition of snags within specific volume classes and forest types. The Project Team analyzed this data to determine if prior harvest has reduced the number of snags below 275 snags per 100 acres. The analysis assumed that no structure has been retained in any previously harvested units in the Control Lake Project Area and that Volume Class 3 does not contain enough snags of sufficient size to address. VCU's, which are assumed to approximate fourth order watersheds, were used as the basis of analysis.

Analysis of the 13 VCU's indicates that snag densities exceed the recommended minimum level in all of the VCU's (Table 3-26).

Table 3-26
Snags Per Acre by VCU

VCU	Acres	Snags/Acre
574	22,510	19.36
575	34,570	18.92
576	13,051	19.09
577	13,841	19.49
578	12,140	18.64
591	4,299	18.91
592	5,802	19.59
593	4,187	19.58
594	6,643	19.64
595	12,562	18.05
596	8,025	18.52
597.1	3,486	17.50
597.2	12,573	19.09

Assumptions:

1. Snags/Volume Class (VC) are based on Snag Transects conducted during the 1993 field season.
2. VC 0 and 3 do not contain enough snags of sufficient size to count towards the goal.
3. Snags/Acre calculated as a weighted average based on forest acres.
4. Harvest acres listed as VC 3 were field-verified as VC 4 acres and treated as such.
5. Harvest acres listed as VC 0 were left as is.

Threatened, Endangered, and Sensitive Species

Key Terms

Category 2 Candidate—a species or group of species being considered by the U.S. Fish and Wildlife Service for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat.
Category 3 Candidate—species that are now considered to be more abundant and/or widespread than previously thought.
Endangered—a species in danger of extinction throughout all or a significant portion of its range.
Haul out—area of large, smooth, exposed rocks used by seals and sea lions for resting and pupping.
Sensitive—species (identified by the Regional Forester) whose population viability is of concern on national forests within the region, and which may need special management to prevent their being placed on State and Federal threatened and endangered species lists.
Threatened—a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Federally listed threatened and endangered species are those plants and animals formally listed by the USFWS or the National Marine Fisheries Service (NMFS), under the authority of the Endangered Species Act of 1973, as amended. Candidate species are those being considered for listing as threatened or endangered by the USFWS or NMFS. The State of Alaska has an Endangered Species Law which authorizes the Commissioner of the ADF&G to list species which are endangered in Alaska. The Regional Forester of the Forest Service can also designate species as "sensitive." Sensitive species are those plant and animal species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Information on threatened, endangered, and sensitive species distributions and occurrences in the Project Area was obtained from agency contacts, a review of the available literature on these species in Southeast Alaska, and a general walk-through of each proposed harvest unit by ID survey teams. In addition, specific surveys were conducted for northern goshawks and marbled murrelets following USFWS and/or Forest Service accepted protocols.

Plants

The policy of the Tongass National Forest is to "provide sufficient habitat to preclude the need for listing species under the Endangered Species Act due to national Forest habitat conditions" (TLMP, 1997). Plants of concern are listed by the USFWS as endangered or threatened under the Endangered Species Act of 1973 or species identified as sensitive by the Regional Forester. Under the Endangered Species Act , an endangered species is defined as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Currently, no plant species native to Southeast Alaska are Federally listed as endangered or threatened. However, four species are currently considered Category 2 Candidate Threatened or Endangered Species (TLMP, 1997). Category 2 species have evidence supporting formal listing as threatened or endangered but adequate information is not yet available on biological vulnerability or threats to justify final listing. None

of these species has been found in the Tongass National Forest so far, and potential habitat for only one of the species, thickglume reedgrass (*Calamagrostis crassiglumis*), exists within the Control Lake Project Area. Potential for occurrence of the four candidate species in the Project Area is summarized in Table 3-27.

Currently, there are 11 species (including *Carex lenticularis* var. *dolia* which is also a candidate species) on the Region 10 list of sensitive plant species that may occur in the Project Area. One of the Region 10 sensitive species is known to occur in the Project Area, and several species are suspected to occur. No observations of Region 10 sensitive plant species were made in the Project Area based on field reconnaissance of potential harvest units by interdisciplinarily trained teams. Potential for occurrence of sensitive plants in the Project Area is summarized in Table 3-27.

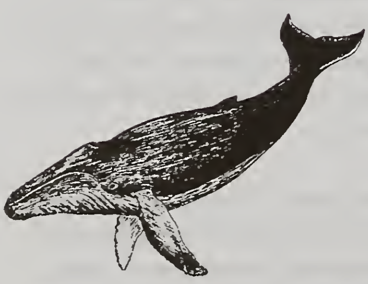
Fish

No threatened, endangered, or sensitive fish species occur in the Project Area.

Wildlife

Two Federally endangered wildlife species—the humpback whale (*Megaptera novaeangliae*) and Eskimo curlew (*Numenius borealis*)—potentially migrate through the area, and three Federally threatened species—the Aleutian Canada goose (*Branta canadensis leucopareia*), American peregrine falcon (*Falco peregrinus anatum*), and Steller sea lion (*Eumetopias jubatus*)—potentially migrate through or occur in the Prince of Wales Island area. Also, eight Federal candidate Category 2 species—the Alexander Archipelago wolf (*Canis lupus ligoni*), Arctic peregrine falcon (*Falco peregrinus tundris*), marbled murrelet (*Brachyramphus marmoratum*), Kittilitz's murrelet (*Brachyramphus brevirostris*), Queen Charlotte goshawk (*Accipiter gentilis laingi*), harlequin duck (*Histrionicus histrionicus*), olive-sided flycatcher (*Cantopus borealis*), and the spotted frog (*Rana pretiosa*)—potentially occur in the area. The Peale's peregrine falcon (*Falco peregrinus pealei*), osprey (*Pardion haliaetus*), and trumpeter swan (*Cygnus buccinator*), Forest Service Region 10 sensitive species, also occur on the island. The Queen Charlotte goshawk is also on the Forest Service Region 10 sensitive species list. The Franklin's grouse (*Dendragapus canaderis franklinii*) is addressed in this section, even though it is not a threatened, endangered, or sensitive species, because of concern expressed by the ADF&G.

Humpback Whale



Humpback whales are found in coastal areas or near oceanic islands and appear to have a preference for nearshore waters, especially the highly productive fjords of Southeast Alaska and Prince William Sound (Calkins, 1986). Humpbacks remain in the Gulf of Alaska throughout the summer and fall and begin their southward migration in November; however, some humpbacks have been reported to winter in Southeast Alaska waters (Calkins, 1986). The current population of humpback whales in the North Pacific is estimated at between 1,200 and 2,000 animals (National Marine Fisheries Service, 1991), less than 10 percent of the estimated pre-exploitation population size (Johnson and Wolman, 1984). Currently, about 300 to 350 whales, or 30 to 35 percent of the entire North Pacific population of humpbacks (Calkins, 1986), gather in Southeast Alaska waters during the summer and fall to feed on abundant populations of euphausiids (*Euphausia pacifica*), Pacific herring (*Clupea harengus*), and capelin (*Mallotus villosus*) (Johnson and Wolman, 1984).

Because the humpback whale occupies nearshore waters, it is especially vulnerable to environmental degradation and human disturbances associated with off-shore petroleum exploration and production, ocean dumping, toxic chemical pollution, coastal logging, mining and manufacturing, fishing, resort development, and pleasure boat and cruise ship traffic (Johnson and Wolman, 1984). Such activities may disrupt whale feeding or result in damage to important habitat areas (Johnson and Wolman, 1984). Critical habitat has not been designated for

Table 3-27
Candidate Threatened/Endangered and Sensitive Plant Species Potentially Occurring in the Project Area

Species	Potential for Occurrence in Project Area
	Candidate Species
Aster yukonoensis	Not likely; outside known range.
Calamagrostis crassiglumis	May occur in marshy wet areas, but not muskegs; not known from POW Island.[1/]
Carex lenticularis var. *dolia*	Not likely; coastal mountains of southern Alaska, but not in forested areas.
Montia bostockii	Not likely; outside known range.
	Sensitive Species
Cirsium edule	Not expected based on range; wet meadows and open woods along glacial streams.
Glyceria leptostachya	May occur in wet lowland habitats including swamps, and stream and lake margins; known from Control Lake vicinity on POW Island.
Hymenophyllum wrightii	May occur in humid, shaded habitats in association with boulders, cliffs, and tree trunks; not known from POW Island.
Isoetes truncata	May occur in shallow water of lakes and streams; not known from POW Island.
Lingusticum calderi	May occur on rocky cliffs; open, boggy, or rocky slopes; and forest edges in alpine or subalpine areas. Not known from POW Island.
Platanthera chorisiana	Not likely in heaths, swamps, and sphagnum bogs; not known south of Chicagof Island.
Plantanthera gracilis	May occur in wet open meadow habitats; not known from POW Island.
Poa laxiflora	May occur in moist, open, lowland woods and open forested meadows; not known from POW Island.
Ranunculus orthorhynchus var. *alaschensis*	May occur in moist, open lowland meadows and other moist, open habitats; known from near Craig.
Senecio moresbiensis	May occur in shady, wet areas and bogs on open, rocky, or boggy slopes and in open, rocky heath and grass communities; known from Kasaan Mountain on POW Island.

Source: USDA Forest Service, 1994.

[1/] POW Prince of Wales

humpback whales; however, summer and fall concentrations of humpback whales have been observed in Southeast Alaska at Frederick Sound, Salisbury Sound, Stephans Passage, and Glacier Bay (Baker et al., 1985; Calkins, 1986). However, humpbacks may occur throughout Southeast Alaska, including the waters surrounding Prince of Wales Island. For example, humpback whales were observed in Clarence Strait off Coffman Cove in September 1993 by project biologists.

Steller Sea Lion

The Steller sea lion is widely distributed over the continental shelf and throughout the coastal waters of the Gulf of Alaska (Calkins, 1986). Although population declines have been reported throughout most of the range of this species, sea lions in Southeast Alaska have experienced less dramatic population declines (TLMP, 1991a).

The most significant factors affecting Steller sea lion populations include: (1) reductions in availability of food; (2) commercial harvest of pups; (3) subsistence harvest of sea lions; (4) harvests for public display and scientific research purposes; (5) predation by sharks, killer whales (*Orcinus orca*), and brown bears (*Ursus arctos*); (6) disease; (7) inadequate regulatory mechanisms such as quotas on incidental harvest during commercial fishing operations; and (8) other natural or human factors such as illegal shooting of adult sea lions at rookeries, haul-out sites, and in the water near boats (TLMP, 1991a). None of these factors are regulated by or are within the jurisdiction of the Forest Service, and critical habitat for Steller sea lions has currently not been designated. However, a Steller sea lion haul-out has been located by the NMFS on the southern point of Grindall Island just south of the Kasaan Peninsula at Baker Point (letter from S. Pennoyer, NMFS, Anchorage, Alaska, February 6, 1992). The nearest LTF associated with the project occurs at Thorne Bay, approximately 24 miles northwest of this haul-out; the haul-out is currently exposed to log shipment activities originating from Forest Service and private LTF's. The nearest Steller sea lion rookery occurs over 60 miles southwest of the Project Area boundary at Forrester Island (Loughlin et al., 1984).

Alexander Archipelago Wolf

Because the Alexander Archipelago Wolf is a MIS species, it is addressed in the *Wildlife* section.

American Peregrine Falcon

The American peregrine falcon is primarily associated with the boreal forest region of interior Alaska (USFWS, 1982; Craig, 1986). It occurs in Southeast Alaska only during migration periods (letter from N. Holmberg, USFWS, Anchorage, Alaska, March 5, 1992; USDA Forest Service, 1992c). Population declines in peregrine falcons occurred after World War II and were due primarily to reductions in breeding habitat and contamination from organochloride pesticides (USFWS, 1982). However, this subspecies has recently experienced increases in population and reproduction, and the USFWS has recently (October 5, 1994) down-listed the species from endangered to threatened.

Actual migration routes and foraging areas of peregrine falcons in Southeast Alaska have not been identified and specific use of the Project Area is unknown. However, the Project Area is within the migratory pathway of American peregrine falcons (Anderson et al., 1988), although most coastal migrants are apparently the non-listed Peale's (*F. p. pealei*) subspecies and most American peregrines migrate inland. Peregrines potentially migrating through the area probably forage on prey species that they are known to use elsewhere, including shorebirds, waterfowl,

and songbirds (Anderson et al., 1980). Marshes and riparian areas are particularly important peregrine feeding areas, since they attract and concentrate prey species (Craig, 1986).

Arctic Peregrine Falcon

The Arctic peregrine falcon is primarily associated with the area north of the Brooks Range and Seward Peninsula; it is highly migratory, wintering as far south as northern Argentina (Ambrose et al., 1988). It occurs in Southeast Alaska only during migration periods. Population numbers have increased three-fold in Alaska (ADF&G letter, Feb. 6, 1987; Ambrose et al., 1988; minutes of Interagency Wildlife Technical Committee Meeting of March 20, 1991). Effective November 4, 1994, the USFWS removed the species from the threatened list. It now has the status of a Category 2 candidate species.

Peale's Peregrine Falcon

The Peale's subspecies of the peregrine falcon (*F. p. pealei*) nests on the outer islands west of the Project Area (Schempf, 1981, 1982). An active peregrine falcon nest, probably of this subspecies, was recently discovered in the Steelhead Creek drainage of the Project Area. This subspecies is not listed as endangered or threatened, but is covered by a provision of the "similarity of appearance" which broadens the scope of protection for all peregrine falcons. The nest distribution of this subspecies is closely associated with large seabird colonies, and seabirds are believed to be the major prey of the falcon.

Osprey

Osprey occur in low numbers in Southeast Alaska during the spring/summer nesting period from late April through August. They are believed to overwinter in Mexico and Central America. Osprey have been observed along the lower Thorne River during migration, but all documented nest sites occur outside the Control Lake Project Area. There are eight documented osprey nest sites and four known nesting pairs at Thomas Bay, Wrangell Narrows near Finger Point, and near the mouth of McCormick Creek on Wrangell Island (Hughes, undated, as cited in USDA Forest Service 1991b). Sightings of osprey have also been recorded at Towers Arm, Irish Lakes, and Kah Sheets on Kupreanof Island. Nest trees in these areas consist of broken-top spruce (live or dead) and snags of western hemlock in hemlock/spruce forest types near streams or coastal beaches. Historically, the Southeast Alaska population of osprey appears to have remained stable but low. It is unknown why osprey occur in relatively low numbers in this region, but available nest sites and foraging areas do not appear to be limiting factors.

Eskimo Curlew

Eskimo curlews once ranged from arctic North America to southern South America, migrating seasonally by way of the Atlantic and Central flyways (Gollop, 1988). The species formerly occupied western and northern Alaska, but is now considered an accidental in Alaska (Armstrong, 1991) and one of the rarest birds in North America (Gollop, 1988). Eskimo curlews migrate along the Alaskan interior and any occurrences along coastal regions are highly unlikely (Armstrong, 1991). The species has not been sighted in Alaska since 1986 (Armstrong, 1991).

Trumpeter Swan

Trumpeter swans winter in specific ice-free areas throughout Southeast Alaska (letter from J. N. West, Forest Service, Ketchikan, Alaska, to C. Crocker-Bedford, Forest Service, Ketchikan, Alaska, July 2, 1991). However, swans appear to show extreme fidelity to specific wintering

areas (Gale, 1989). Although information on wintering habitats and populations of trumpeter swans in Southeast Alaska is limited, in general swans winter along estuaries, intertidal lakes, streams, and muskegs (letter from C. Crocker-Bedford, USDA Forest Service, Ketchikan, Alaska, July 2, 1991). Wintering locations include open areas with adjoining grassflats with level terrain that allow swans to rest, feed, or fly without restricting visibility or movement. Swans wintering on Prince of Wales Island tend to use areas with good winter sun exposure and protection from prevailing southeasterly winds (letter from C. Crocker-Bedford, USDA Forest Service, Ketchikan, Alaska, July 2, 1991).

Major concentration areas of wintering trumpeter swans nearest the Project Area include Sweetwater Lake, Sarkar Lakes, Big Salt Lake, and the Thorne River. Prince of Wales Island (Belrose, 1976) and specifically Sweetwater Lake and Sarkar Lakes (Olson, 1978) has long been recognized as important wintering areas for this bird. Each support 25 to 100 swans annually (USDA Forest Service files). In addition, up to 30 birds are found each winter using Big Salt Lake (USDA Forest Service files). Within the Project Area, small numbers (1 to 20) of trumpeter swans can be found wintering at the Honker Divide open water areas (Honker Lake, Hatchery Lake, Lake Galea, upper Thorne River, etc.), at Control Lake, and in the lower Thorne River near the estuary and Goose Creek (USDA Forest Service files).

Aleutian Canada Goose

The Aleutian Canada goose nests on Buldir and Chagulak islands in the Aleutian Archipelago and winters primarily in the San Joaquin Valley of California (Amaral, 1985). The species sometimes stops along the Oregon coast and occasionally is reported along the Washington coast while on way to wintering grounds in California (Amaral, 1985). Aleutian Canada geese are believed to have historically wintered from British Columbia to California (Amaral, 1985). Although there are no records of Aleutian Canada geese on Prince of Wales Island, the area is within their migratory route (personal communication, J. Lindell, Endangered Species Coordinator, USFWS, Anchorage, Alaska, September 18, 1992). Any migrating geese stopping over on Prince of Wales Island would likely be found resting in the coastal wetland areas.

Marbled Murrelet

The marbled murrelet was recently listed as threatened in California, Oregon, and Washington. Marbled murrelets, however, are still abundant in Alaska where they are currently considered as a candidate for Federal listing. Recent estimates by Piatt and Ford (1993) place the Alaska population of marbled murrelets at between 153,030 and 166,470 with an estimated 96,200 birds occurring within the Alexander Archipelago during the breeding season.

Between 1989 and 1993, approximately 43 tree nest sites were found in North America, at least 17 of which were found in Alaska (Naslund and Hamer, 1993). Nest sites have been located in mature and old-growth forests comprised of Douglas-fir, coast redwood (*Sequoia sempervirens*), western red cedar, mountain hemlock, Sitka spruce, and western hemlock (Ralph and Nelson, 1992). Five nest sites in Southcentral Alaska were located in mountain hemlock (personal communication, T. Hamer, Hamer Environmental, Sedro Woolley, Washington, May 25, 1992), while two nest sites found in British Columbia were located in Sitka spruce. In

addition, during field investigations for the nearby Polk Inlet Project, marbled murrelet eggshell fragment were found at three locations, indicating the existence of three nest sites. Subsequent examinations of surrounding trees led to the actual discovery of a marbled murrelet nest site at one of the locations. Only two other marbled murrelet nest sites have been located in Southeast Alaska, including a nest found near Hatchery Creek immediately north of the Project Area on July 23, 1993 (Quilan and Hughes, 1990; Ford and Brown, 1995). The Hatchery Creek nest was located on an exposed western hemlock root overhanging an 11-m cliff.

The limited data on marbled murrelet nesting behavior are inconclusive regarding nest-site fidelity. Marshall (1988) observed a murrelet nest in California in a tree that appeared to be used over a period of several years. However, Ralph and Nelson (1992) indicate that murrelets (no location given) are not known to reuse individual nest trees. Based on high nest-site fidelity observed in other alcid species, it is highly probable that marbled murrelets at least have strong fidelity to certain forest stands that have been used for nesting (personal communication, T. Hamer, Hamer Environmental, Sedro Woolley, Washington, September 24, 1992). This is supported by recent work on murrelet nesting behavior in California where murrelets have been observed repeatedly nesting in "loose" colonies in different portions of the same forest stand (Marshall, 1988; Ralph and Nelson, 1992).

Three primary factors that may limit marbled murrelet reproduction or survival include removal of old-growth habitat, mortality from gill-net fisheries, and oil pollution (Marshall, 1988). Information on murrelet nesting mortality indicates that this species is also highly susceptible to nest-site predation from avian predators that are associated with forest edges and fragmented landscapes. For example, the exposed Hatchery Creek nest failed, apparently very soon after hatching (personal communication, Cheri Ford). Consequently, fragmentations of contiguous old-growth areas by logging and associated predator concentrations along forest edges have the potential to adversely affect murrelet nesting success within an area (personal communication, T. Hamer, Hamer Environmental, Sedro Woolley, Washington, September 25, 1992).

Prince of Wales Island, and the Project Area in particular, is heavily used by nesting marbled murrelets. During this project, marbled murrelets were detected at 96 percent (26) of 27 harvest units surveyed for these birds between June 25 and August 3, 1993. Units selected for surveying were generally dominated by volume class 5 and larger timber and had an average slope of less than 50 percent. The number of birds detected per unit ranged between 2 and 133, and averaged 45. Occupancy behaviors, indicative of nesting occurring within the stand, were noted in at least 11 (41 percent) units. However, 12 to 133 birds were detected in 12 of the units where occupancy behaviors were not noted, indicating a likelihood that some of these birds were nesting in these stands as well. In addition, marbled murrelet eggshell fragments were found in a muskeg near harvest unit 595-411 on June 23, 1993, and a whole egg was found also in a muskeg near unit 577-425 on July 29, 1993.

Close examination of murrelet survey results suggests a possible relationship between the degree of fragmentation of the area and the percent occupancy behavior, and average number of birds detected (Table 3-28). Lowest values for both categories were observed for harvest units in the western peninsula area, and highest values for both categories were observed in the Honker Divide area. The western peninsula area has the greatest degree of old-growth fragmentation (most natural), while the Honker Divide area has the lowest degree of the four areas studied (refer to Existing Environment map in Chapter 2).

Table 3-28
Marbled Murrelet Survey Results by Area Sampled

Area	VCU's	No. of Units Surveyed	% Occupancy Observed	Avg. No. of Birds Detected
Western Peninsula	591,592,593	11	27.0	30.5
Steelhead Creek	595	6	33.0	51.0
Logjam Creek	577	2	50.0	39.0
Honker Divide	574,575,576,578	8	62.5	65.1

Kittlitz's Murrelet

Kittlitz's murrelet is a small seabird belonging to the Alcidae family. Information is limited on the natural history of this species. Kittlitz's murrelet is distributed near glacial waters from Pt. Barrow south to at least Glacier Bay, most commonly from Cape Prince of Wales south to Glacier Bay from spring through fall (Robbins et al., 1983; Peterson, 1990). Winters are spent feeding in offshore pelagic waters. Kittlitz's murrelet forages on crustaceans in inshore marine waters during the breeding and nesting season in Alaska. Nests are generally located inland on the ground above the timberline in coastal mountains at the base of north-facing slopes. Nesting may also occur on unvegetated glacial moraines, grassy ledges of island sea cliffs, and barren ground on coasts (Ehrlich et al., 1988). One egg per clutch is laid on the bare ground amid lichen-covered rocks. Young Kittlitz's murrelets born at inland nests are believed to swim down streams to reach the sea.

Queen Charlotte Goshawk

Estimated densities of goshawks in Southeast Alaska range from 0.4 to 0.9 pair per 10,000 acres of forested land having over 8 MBF/acre, with most sightings reported south of Frederick Sound (Crocker-Bedford, 1992). Estimated habitat capability for goshawks ranges from 8 pairs for the South Prince of Wales Island Province to 16 pairs for the North Central Prince of Wales Island Province (TLMP, 1991a). This represents about 2 to 4 percent of the total goshawk habitat capability for all 21 ecological provinces on the Tongass National Forest (TLMP, 1991a). Twenty-one goshawk nest areas were documented with activity in Southeast Alaska between 1990 and 1993 (Titus et al., 1994). At least one nest site was located at 18 of these areas, including 8 active nests in 1993. In 1994, a total of 33 historic and current sites with at least one nest were documented; active nests were located at 21 of these sites (ADF&G, 1994). The Tongass National Forest has adopted interim habitat management recommendations for the Queen Charlotte goshawk (letter from M. Barton, USDA Forest Service, Juneau, Alaska, August 18, 1992). These guidelines provide for the surveying, identification, protection and monitoring of Queen Charlotte goshawk nest sites within the Tongass National Forest.

Preferred habitat for goshawks during the breeding season includes large tracts of mature and old-growth forests (Bartlet, 1977; Hennessy, 1978; Reynolds et al., 1982; Reynolds et al., 1991; Crocker-Bedford, 1990a, 1990b), although a range of forest age classes has been hypothesized as essential for providing suitable prey populations in goshawk foraging territories in the southwestern United States (Reynolds et al., 1991). Goshawk abundance has been associated with the proportion of high volume timber and degree of habitat fragmentation in an area. A preliminary habitat model estimated that goshawks in Southeast Alaska are about 3.5 times more numerous in landscapes characterized by relatively high (84 percent) percentages of productive old-growth (>8 MBF/acre) than in landscapes with only 50 percent productive old-growth

(Crocker-Bedford, 1990a). In addition, goshawks occur in higher numbers in contiguous stands with low levels of forest fragmentation (Woodbridge, 1988). Consequently, this species may act as an indicator of the degree of forest fragmentation and proportion of high-volume timber available in a managed forest landscape. A discussion of existing levels of fragmentation within the Project Area is presented in the *Biodiversity* section.

A preliminary model used by the Forest Service to evaluate goshawk habitat capability under timber management alternatives indicated a possible past decline in goshawk populations of at least 30 percent in Southeast Alaska and more than 50 percent within the subspecific range of the Queen Charlotte subspecies (Crocker-Bedford, 1990a). Population declines in goshawks are apparently related to intensive timber management (Reynolds and Wight, 1982; Moore and Henny, 1983; Crocker-Bedford and Chaney, 1988; Kennedy, 1988; Crocker-Bedford, 1990a, 1990b; Patla, 1991). Consequently, the northern goshawk has been designated as a Category 2 Candidate Species for threatened or endangered status throughout its range in the United States and as a Forest Service sensitive species in Alaska and other regions. Its status is currently under review in Southeast Alaska.

Goshawk surveys were conducted in the Project Area during the summer of 1993. Fifty-four potential harvest units with timber volumes of 8 MBF/acre or higher were surveyed between June 18 and July 23. In addition, over 25 miles of secondary roads were surveyed, targeting road systems not surveyed by ADF&G the previous summer. No goshawks were detected during these surveys except at Harvest Unit 596-426 where a single goshawk was observed at two different calling stations on June 23. A follow-up survey was conducted, but no birds were redetected.

In addition, goshawk sightings or suspected goshawk sightings were made at three different potential harvest units during resource surveys. On July 23 an alarmed goshawk was observed at a potential harvest unit near Logjam Creek in the northwestern corner of the Project Area. A nest site and one fledged juvenile were subsequently found by Forest Service biologists near the unit on July 31. On August 4, the juvenile and the adult male were captured and radio-tagged by Forest Service and ADF&G biologists. The male was later found dead (on November 3) near Coffman Creek, apparently from starvation. A PFA was designated in the northwest corner of the Project Area around the nest site.

Suspected goshawk sightings were also made on July 23 at Unit 593-406, and on August 3 at Unit 593-417. Because these two units are only one mile apart, the sightings may have been of the same bird or its mate. No goshawks were detected at these units during follow-up surveys.

On June 15, 1995, a second goshawk nest was found within the Project Area in the lower Rio Roberts drainage, south of the 30 Road. Both adults were radio-tagged in an effort to collect home range information for use in delineating a PFA. By the end of July 1995, two young had been fledged from the nest.

Harlequin Duck

In Alaska, the harlequin duck has been reported as a fairly common year-round resident, and at one season or another, has been recorded over much of the state except the Arctic coast (Gabrielson and Lincoln, 1959). Its range includes northeast Siberia and extends south to Wyoming and California. On the east coast it occurs in Iceland, Greenland, and Labrador and winters as far south as New Jersey. Available evidence indicates that the species breeds locally over much of southern Alaska, probably the Aleutians, and north to Anaktuvuk Pass. All ornithologists who have worked during the spring and summer months in the Alexander Archipelago and other parts of Southeast Alaska have commented upon the numbers of these

ducks, frequently summarizing their observations by stating that they were common or abundant (Gabrielson and Lincoln, 1959). They nest along inland fast-moving rivers and streams, usually within 6 feet (but up to 60 feet) of water (DeGraaf et al., 1991). During the winter the harlequin duck is common to abundant in the coastal waters of Southeast Alaska, Prince William Sound, Cook Inlet, the bays of the Alaska Peninsula, the Aleutians and the Pribilofs (Gabrielson and Lincoln, 1959).

Olive-sided Flycatcher

The olive-sided flycatcher breeds in wooded regions from central Alaska east to Newfoundland and south to northern Baja California and central Arizona in the West, central Minnesota and northern Michigan in the Central States, and North Carolina and Tennessee in the East. The species winters in South America. It inhabits open coniferous forests and forest edges along lakes, streams, and muskegs (Bent, 1942). Godfrey (1979) described the habitat of the species as "burntlands with standing dead trees, bogs, lakeshores with water-killed trees, lumbered areas, and other clearings in woodland; sometimes tall trees about farmland, occasionally orchards." DellaSala et al. (1994) noted that the species was often observed using habitats associated with lakes and muskegs during a breeding bird study on central Prince of Wales Island.

Spotted Frog

Distribution of the spotted frog in Southeast Alaska is confined to coastal forests where it breeds in association with permanent bodies of water, including grassy margins of lakes, rivers, and streams (Hodge, 1976; Broderson, 1982; Nussbaum et al., 1983). Although the species is primarily aquatic (Hodge, 1976; Broderson, 1982; Nussbaum et al., 1983), spotted frogs have been reported moving overland in spring and summer (Behler and King, 1979).

Declines in the distribution and abundance of spotted frogs have been noted in western Canada and the Pacific Northwest (McAllister and Leonard, 1991), and these declines are apparently related to destruction of terrestrial and aquatic habitats and predation by bullfrogs (*Rana catesbeiana*) (Nussbaum et al., 1983; McAllister and Leonard, 1991b). Consequently, spotted frogs are a Federal Candidate 2 species, and are currently being considered for listing in portions of their range (McAllister and Leonard, 1991; personal communication, K. McAllister, Washington Department of Wildlife, Nongame Program, Olympia, Washington, August 18, 1992).

No spotted frogs were observed during reconnaissance surveys of potential harvest units conducted by ID survey teams.

Franklin's Grouse

The Franklin's grouse (*Dendragapus canadensis franklinii*) is another species of concern in Southeast Alaska, although it is not listed as threatened, endangered, sensitive, or as a candidate. A nest was observed near the head of Twelvemile Arm in the Polk Inlet Project Area in 1903 (Osgood, 1903) and an observation of a female with chicks was made in this area in 1992 (Gustafson, 1994). The species uses old-growth forests, especially those containing spruce, young second growth prior to canopy closure, as well as other habitats. The species is considered to be present in low densities on and near Prince of Wales Island by Gustafson (1994); however, the frequency of observations by Forest Service biologists suggest it is fairly common, at least in the Control Lake Project Area (personal communication, Cheri Ford, July 26, 1995).

Biodiversity

Key Terms

Biodiversity—the variety of lifeforms in an area, including variation in structure, composition and function at scales from genetic to landscape.
Canopy— uppermost layer of foliage in the forest.
Corridor—a patch, strip, or linear feature of habitat linking or providing connectivity between larger patches.
Edge—boundary between two distinct ecosystems, such as between forest and muskeg.
Edge effects—the biological and abiotic actions operating at edges; examples are differences in microclimate, species richness, productivity, and predation.
Fragmented—reduced in size and connectivity. The degree of fragmentation is dependent upon scale (in space and time) and species specific life requisites.
Forage—to search for food.
Patch—an assemblage of similar vegetation. In this document, the focus is on old-growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.
Planning area—for the purpose of analyzing viable populations, the planning area is the ecological province, i.e., North Central Prince of Wales Province and South Prince of Wales Province.
Snag—standing dead tree.
Viable population—the number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations well distributed throughout their range in the National Forest.

Wildlife managers and ecologists are becoming more involved in conservation biology, which is an applied science directed towards maintaining genetic diversity of species and the integrity of ecosystems. The principles of conservation biology are being incorporated into wildlife management to maintain biodiversity. Biodiversity is important because the loss of one component of an ecological community may cause the entire community to unravel. There are many complex interrelationships among organisms which make up most communities. An example is the important role of large trees in an old-growth forest in providing habitat for mammals, birds, and fish. As the trees die and are slowly decomposed and recycled through the ecosystem, they become inhabited by an entirely new flora and fauna.

Stand, Between Stand, and Landscape Biodiversity

Timber management activities that result in fragmentation of continuous forest blocks have been recognized as one of the major types of human impacts to biodiversity (Harris, 1984). As such, it is important to understand how timber management affects biodiversity not only within the specific unit being harvested but in larger areas encompassing entire watersheds and Project Areas as well. Therefore, biodiversity needs to be examined at multiple spatial scales, including within individual harvest units, between adjacent stands, and across the entire Project Area (Whittaker, 1972; Sidle, 1985).

Stand-level diversity is the diversity within specific habitats or limited land areas as measured by number of species present (species richness) or structural complexity of a given habitat type (Sidle, 1985). Timber harvest influences stand-level diversity through changes in the vegetative composition, structure, and associated wildlife species of a stand. For instance, the number of breeding birds in Southeast Alaska has been shown to decline from 13 species in old-growth, spruce-hemlock forests to just 3 species immediately following logging (seedling/sapling stage) as vegetation structure and species composition is greatly simplified (Sidle,

1985). As clearcuts (seedling/sapling stage) succeed to mid-successional stages (sapling/shrub and pole), species richness temporarily increases to 10 to 14 species, but declines again to 7 species in older seral stages (young sawtimber) due to the loss of understory vegetation associated with canopy closure. Retention of snags, live trees, and down woody debris can be used to enhance stand-level diversity by maintaining a portion of old-growth structure within regenerating stands (Sidle, 1985; DellaSala et al., 1993).

Between-stand diversity reflects the amount of species turnover between habitat types or along environmental gradients (Sidle, 1985). The spatial distribution of harvest units across an analysis area may influence the types of environmental gradients affecting between-stand diversity levels. Consequently, by clearcutting old-growth forest, timber management practices have a tendency to increase between-stand diversity by maximizing the amount of edge area and degree of contrast between adjacent stands. Between-stand diversity is therefore highest in landscapes characterized by alternating patterns of forest patches and clearcuts or natural openings compared to a contiguous forest matrix. The increased amount of edge provides habitat for species such as crows, ravens, great-horned owls, black bears, and wolves. However, the associated increases in between-stand diversity levels are likely to be at least partially offset by declines in forest interior species due to increases in predator populations along forest edges (Gates and Gysel, 1978), or patches of habitat becoming too small to maintain a group of animals or to support a pair's life requisites.

Landscape-level diversity is a function of the spatial distribution of habitat types across a large area (Sidle, 1985) such as a Project Area or biogeographic region. An area is expected to support high levels of landscape diversity if viable populations of wildlife and habitat types are well distributed across the region or particular landscape (Sidle, 1985; Suring et al., 1992). Timber harvest reduces landscape diversity due to removal of habitat types having high commercial and wildlife value (e.g., low-elevation old growth; high-volume old growth) (Harris, 1984; Sidle, 1985). Species sensitive to reductions in total habitat area and those that are old-growth dependent are particularly vulnerable to fragmentation (Lynch and Whitcomb, 1978; Robbins, 1979; Raphael, 1984; Harris, 1984; Rosenberg and Raphael, 1986; Finch, 1991). Several MIS and TES of the Tongass National Forest attain their highest population densities in contiguous or high volume old-growth forest, including the hairy woodpecker (Raphael, 1984; Suring et al., 1988h), brown creeper (Franzreb and Ohmart, 1978; Suring et al., 1988i; McGarigal and McComb, unpublished data), northern goshawk (Woodbridge, 1988; Crocker-Bedford, 1990a), and marbled murrelet (Hamer and Cummins, 1990; TLMP 1991a). Other species, including Sitka black-tailed deer, marten (Suring et al., 1988c), bald eagle (Suring et al., 1988f), and red-breasted sapsucker (Suring et al., 1988g), are most abundant in low-elevation, old-growth forest. Although site-specific information is sparse for Southeast Alaska, current literature suggests that to maintain population viability within an area or biogeographic region, it is necessary to emphasize the integrity of species-rich areas, such as low-elevation (Harris, 1984) and high-volume, old-growth forest (Suring et al., 1992).

Habitat Diversity

The amount and diversity of habitats within an area will dictate its final diversity. While old-growth forest habitats are most affected by timber harvest, and are used to evaluate biodiversity within this section, species use a variety of other habitats throughout the year. A description of wildlife habitats and their acreages within the Project Area is presented in the *Wildlife* section.

The amount of contiguous old-growth habitat, its distribution within a land management area, and the extent to which similar habitats connect by corridors, are considered key concepts in maintaining biodiversity (Harris, 1984). Because of the importance of unfragmented old-growth forest, and the fact that most MIS chosen for this EIS are old-growth associates or obligates, old-growth habitat, its distribution, patch sizes, amount of interior habitat, connectivity, and fragmentation are used to evaluate biodiversity.

Old-growth stands have an uneven appearance because they contain trees of many ages, sizes, and condition, and contain numerous dead tops and snags. Based on past forest inventories, old-growth stands are assumed to have reached an equilibrium where timber growth equals mortality (TLMP, 1991a). Tree establishment largely depends on LWD (logs and stumps) (Harmon, 1986; Harmon and Franklin, 1989) and gap formation (Alaback, 1988). Woody debris provides microsites for trees to grow on. Gaps created by windthrow or other disturbance allow light to penetrate to the forest floor. This process of tree death and replacement is continual; in any one year, some trees in individual stands are likely to blow down (Harris, 1989). Thus, the forest is a mosaic of older and younger trees, changing yet remaining stable as a forested ecosystem (Borman and Likens, 1979; Alaback, 1988; Schoen et al., 1988; Franklin, 1990).

Old-growth forest is important wildlife habitat for old-growth-associated species such as Sitka black-tailed deer, marten, black bear, Vancouver Canada geese, and cavity- or snag-dependent species such as red-breasted sapsuckers, hairy woodpeckers, and owls. Many species have evolved to use the structural attributes of old-growth forests. The combination of a dense canopy with scattered openings allows forage growth under openings, while the large limbs within the canopy intercept enough snowfall to provide winter food and thermal cover for deer and other species (Kirchoff and Schoen, 1987; Hanley and Rose, 1987). The large, dense stems also provide some measure of thermal insulation in the winter, as well as during cold rains in the spring and summer. Large dead or defective trees become nesting sites for martens, owls, eagles, wrens, and chickadees, as well as feeding sites for woodpeckers, sapsuckers, and others species.

The value of old-growth forest for wildlife habitat is also thought to transcend individual stands. Large, contiguous, unfragmented blocks of old-growth forest are important to species, such as the Queen Charlotte goshawk and marten. The large old-growth blocks provide preferred hunting habitat (goshawks and marten), protection from predators (marbled murrelet), and promote mixing among individuals that would be less likely to breed if they were spatially separated by forest fragmentation (marten). Deer use these large old-growth blocks for survival during heavy snow winters and appear to be less vulnerable to predation when in large blocks of old-growth forest, than in small patches near roads.

Old-growth forests are a decreasing component of the temperate rain forest ecosystem. They differ in ecological function in many ways from younger, even-aged forests. Old-growth stands typically exhibit a wider variety of reproductive niches for species whose existence is thought to be old-growth dependent including animals, understory plants, and microorganisms such as mychorrizae. It appears that these species are most successful when permitted to develop under at least a partially intact mature forest canopy.

Fragmentation and Connectivity

Fragmentation occurs whenever a large continuous habitat is transformed into smaller patches that are isolated from each other by catastrophic windstorms or clearcutting. The changed landscape can function as a barrier to dispersal for species associated with the original habitat. These smaller and more isolated habitats also support smaller populations, which are more vulnerable to local extinction, thereby causing the smaller, more isolated habitats to contain fewer interior forest species. While research on this topic in Southeast Alaska is minimal, the scientific literature describes many examples where fragmentation of formerly widespread terrestrial habitats into remnants of various sizes and degrees of isolation has resulted in extinction of species from blocks of remaining habitat (Harris, 1984; Rosenburg and Raphael, 1986; Gutierrez and Carey, 1985).

Research shows that forest fragmentation results in an increased ratio of forest edge to forest interior and can have a strong negative effect on forest-interior species. As more edge habitat

becomes available as a result of fragmentation, the edge-dwelling species invade the interior environment and become a major threat to the survival of the forest interior-dwelling species. Rosenberg and Raphael (1986) recommended a minimum stand size of 50 acres where delineating old-growth habitat, and suggest that when a stand is greater than 50 percent isolated, the minimum inclusion size increases to 124 acres. By maintaining large contiguous blocks of habitat, the forest interior-dwelling species would realize less competition and predation from open-forest and edge species.

Portions of the Control Lake Project Area have experienced considerable timber harvest during the past 40 years, totalling over 10,000 acres, while other portions of the Project Area remain relatively unharvested. VCU's 577, 578, 591, 595, and 597.2 have sustained the largest amount of timber harvest; VCU's 575, 565, 594, 596, and 597.1 have had light to moderate harvests; and VCU's 574, 592, and 593 have had little harvest (see the Existing Environment Map in Chapter 2). The largest contiguous block of old-growth in the Project Area covers what is known as the Honker Divide area and includes the Cutthroat Lakes area, and lower Thorne River. This block is the largest contiguous block remaining in the central and northern portions of Prince of Wales Island. Other moderate-sized patches of old-growth include portions of Logjam Creek, Steelhead Creek, and Rio Roberts watersheds, the valleys in the Kogish Mountain area, and the Elevenmile drainage. Although the Western Peninsula has experienced little past harvest, it contains no large patches and few moderate-sized patches due to its high degree of natural fragmentation. Similarly, the Drumlin Field landscape zone lying between the Forest Road 30 and lower Thorne River is another area with a high degree of natural fragmentation.

Wilcove (1985) reported elevated predation levels for avian nest sites ranging from 984 to 1,968 feet from the forest edge in small woodlots in Maryland. Studies in the Pacific Northwest indicate the influence of edge on vegetation communities extends from 50 to 450 feet into the forest interior (Chen et al., 1992). In addition, the Forest Service (1991c) considered predation levels to extend 328 feet from the forest edge in lodgepole pine stands subjected to extensive timber harvest in southwest Montana. Given the sensitivity of murrelets and other species to nest-site predation and the relationship between edge effects and avian nesting success, we assumed that forest patches below 8 acres (radius = 328 feet) are essentially all edge and would therefore have a much higher potential for predation of murrelet nest sites.

The analysis of forest fragmentation in the Project Area was based on the total area of old-growth forest patches and the total area of forest interior habitat within specific size classes. Patch size classes were selected to represent MIS requirements based on the species patch size effectiveness curves and HCA recommendations of the VPOP committee (Table 3-29). Old-growth forest patches were defined as the amount of contiguous old-growth of volume class 4 and above. Interior forest patches were defined as old-growth within an individual forest patch that is a minimum of 328 feet away from the forest edge.

Prior to timber harvest (1954), the Project Area contained extensive forest patches that met the criteria of small, medium, and large HCA's (Figure 3-24). In particular, 48,275 acres, or 56 percent, of the old growth throughout the Project Area was in forest patches greater than 10,000 acres (i.e., large HCA's) (Table 3-30). Timber harvest under existing contracts has resulted in declines in the area of this patch size to 29,739 acres or 39 percent of the current old growth, and the conversion of large patches to smaller patch sizes primarily in the 1,000- to 5,000-acre size class (Table 3-30, Figure 3-25). The largest area in interior forest habitat was in the 1,000- to 5,000-acre size class prior to timber harvest (1954). No interior habitat greater than 5,000 acres existed in the Project Area even under prelogging conditions. Past timber harvest has resulted in declines in interior habitat within the 1,000- to 5,000-acre-patch size from 22,069 acres to 10,210 acres under 1995 existing conditions (Table 3-30).

Table 3-29
Patch Size Class Relationships

Patch Size (acres)	Species Relationship
0 to 20	Incorporates optimal patch size for occurrence of brown creeper (15 acres).
20 to 50	Arbitrary, based on the distribution of the data.
50 to 100	Arbitrary, based on the distribution of the data.
101 to 500	Incorporates optimal patch size for occurrence of marten (180 acres), sapsuckers (250 acres), and occurrence of hairy woodpecker (500 acres).
501 to 1,000	Small HCA's, incorporates optimal patch size for productivity of deer (1,000 acres).
1,001 to 5,000	Arbitrary, can also function as small HCA's.
5,001 to 10,000	Medium HCA's.
>10,000	Large HCA's.

SOURCE: Workshop to recommend patch-size relationship and corridor requirements for the MIS and TES species, held in Juneau, Alaska on July 31-August 31, 1989, and Suring et al. 1992.

Fragmentation of existing old-growth results in a reduction in the effectiveness of remaining patches as wildlife habitat. Individual species respond to natural and human-induced fragmentation differently, species like brown creepers and hairy woodpeckers can be supported by smaller patches of forest habitat than species such as deer and marten (Table 3-31). Patch-size effectiveness percentages for 1954 range from 99.4 percent for brown creepers to 93.2 percent for deer (Table 3-32). The values for 1995 vary from 99.1 percent effective to 90.1 percent effective. The greatest difference in percent effectiveness between 1954 and 1995 was for deer, which showed a 3.1 percent reduction in patch size effectiveness.

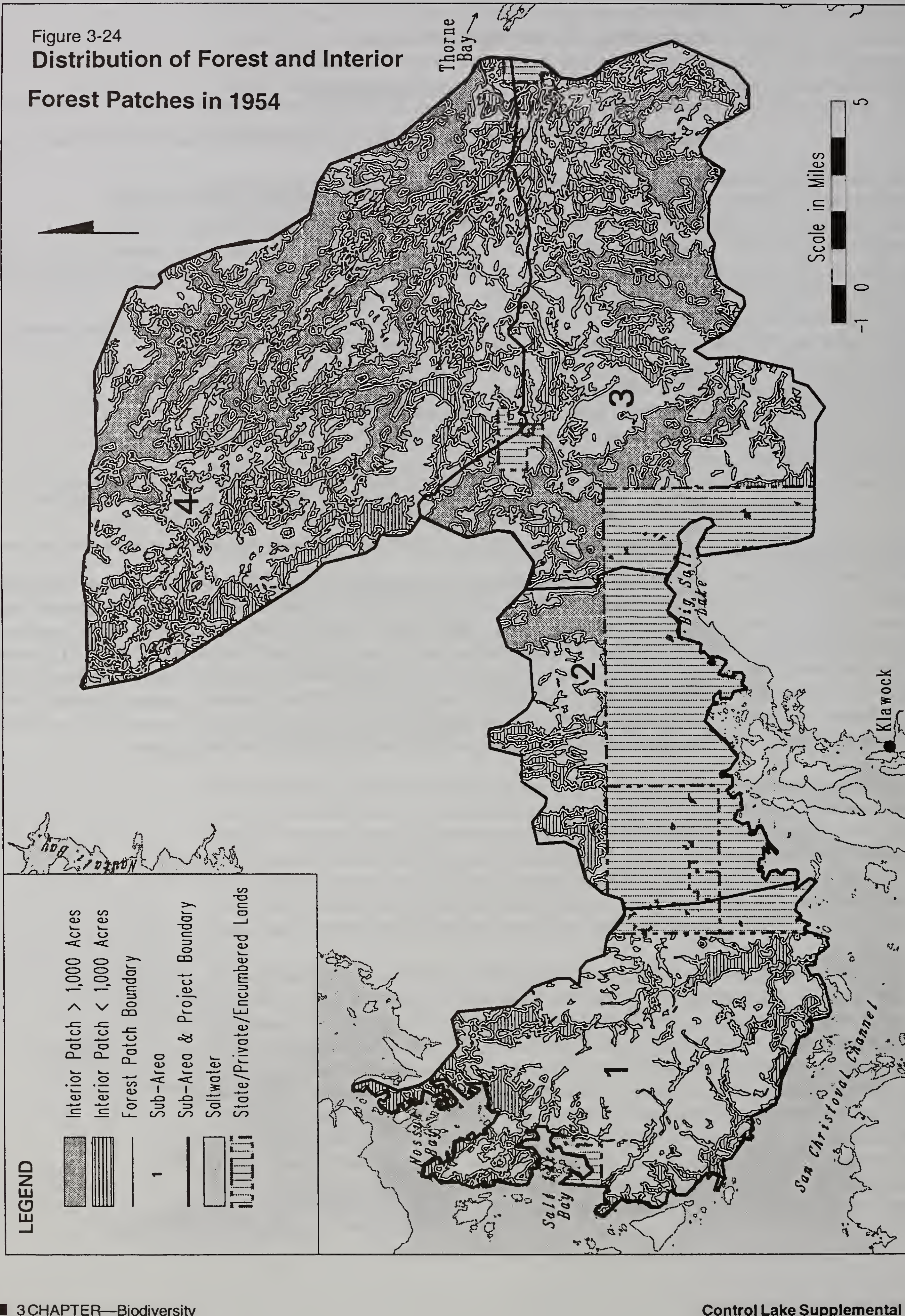


Figure 3-24
Distribution of Forest and Interior Forest Patches in 1954

Figure 3-25
Distribution of Forest and Interior Forest Patches Under Existing Conditions - 1995

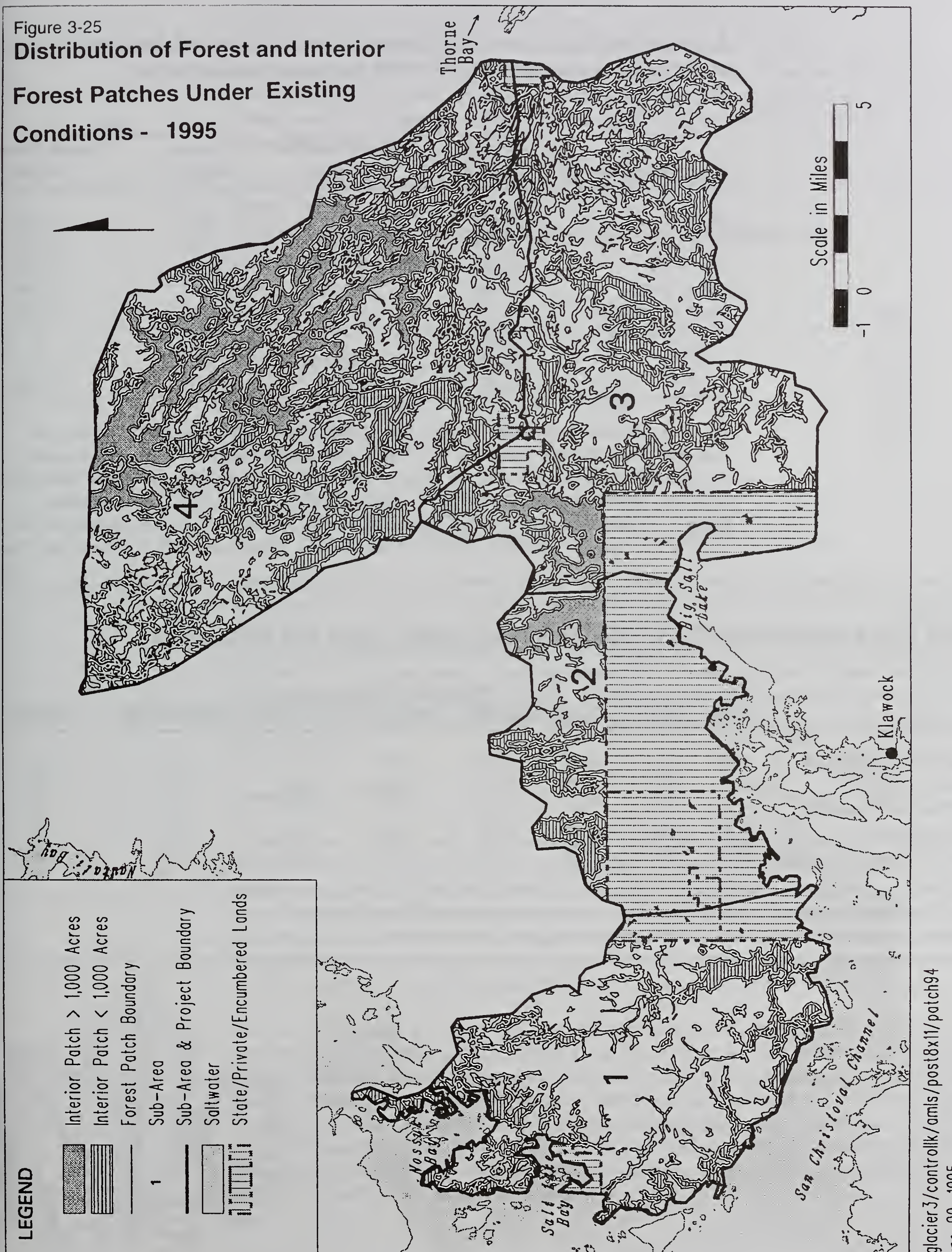


Table 3-30

Area (acres) in Forest Patches and Interior Forest Patches by Size Class for 1954 and 1995 (Existing Conditions)

	1954		1995	
Size Classes (acres)	Forest Patches	Forest Interior Patches	Forest Patches	Forest Interior Patches
20 to 50	2,387	1,154	2,602	1,457
50 to 100	1,784	2,249	2,239	2,174
100 to 500	3,326	6,770	4,908	6,662
500 to 1,000	2,420	2,181	3,467	3,099
1,000 to 5,000	18,315	22,069	24,785	10,210
5,000 to 10,000	8,260	0	6,598	0
>10,000	48,275	0	29,739	0
Total	86,213	35,845	76,161	25,435

The connectivity, or corridors, between habitat patches in a landscape may be at least as significant to maintaining diversity as the size of the patches (Noss, 1983). Forman and Gordon (1981) defined corridors as being of four types: (1) line corridors—those which are all edge and possess no interior habitat; (2) strip corridors—those which maintain interior habitat; (3) stream corridors—those bordering a water source; and (4) network corridors—those which intersect and form patterns. Corridors can function as more than one type. For

Table 3-31

Patch Size Effectiveness Curve Values by Patch Size Class and by Species

	Patch Size Classes (Acres)							
	0-20	20-50	50-100	100-500	500-1,000	1,000-5,000	5,000-10,000	>10,000
Sitka black-tailed deer1/	0.31	0.32	0.35	0.51	0.82	1.0	1.0	1.0
Marten1/	0.08	0.31	0.54	0.96	1.0	1.0	1.0	1.0
Red-breasted sapsucker1/	0.20	0.51	0.61	0.94	1.0	1.0	1.0	1.0
Hairy woodpecker1/	0.02	0.22	0.42	0.70	1.0	1.0	1.0	1.0
Brown creeper1/	0.64	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Source: Workshop to recommend patch size relationships and corridor requirements for the MIS and TES species.

1/ Represents the mean curve value within each patch size class from the species effectiveness curves.

example, when a stream corridor is wide enough to incorporate interior habitat it also functions as a strip corridor. Forman and Gordon's work also highlighted the fact that some interior species will not live in or even migrate through extensive lengths of unsuitable habitat, and that strip corridors were preferable to line corridors. Management of corridors as well as habitat patches should strive to mimic natural patterns; yet there are few instances where connectivity has been recognized to the point of implementation in land-use plans (Noss and Harris, 1986).

Table 3-32
Patch Size Effectiveness Values for Five Management Indicator Species

Species	1954	1995
Sitka black-tailed deer	0.932	0.901
Marten	0.954	0.938
Red-breasted sapsucker	0.963	0.949
Hairy woodpecker	0.938	0.933
Brown creeper	0.994	0.991

Source: MIS habitat capability models.

Another measure of fragmentation in the Project Area is provided by the number of acres of unharvested and unroaded area. The Existing Environment Map in Chapter 2 depicts these unharvested/unroaded areas. The total unharvested/unroaded area represents 112,399 acres or 65 percent of the National Forest System lands in the Project Area. This area is spread among six patches. The largest patch covers the Honker Divide area and upper Logjam Creek while the second largest patch covers the Western Peninsula area. The other patches generally cover the Rio Roberts watershed, upper Steelhead Creek, part of Logjam Creek, and the Kogish Mountain area.

Population Viability

National Forest System lands must be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area (NFMA, 1976). For planning purposes, a viable population is one which has the estimated numbers and distribution of reproductive individuals needed to ensure its continued existence, well distributed in the planning area. To ensure that viable populations are maintained, habitat must be provided to support and sustain at least a minimum number of reproductive individuals and that habitat must be distributed so that those individuals can interact with others in the planning area.

The task of maintaining habitats to support biodiversity has encompassed several approaches, and alternatives continue to evolve. Prior to the TLMP Draft Revision (1991a), the Ketchikan Area identified old-growth habitat areas (for retention and extended rotation) for wildlife and visual concerns. The TLMP Draft Revision (1991a) and the TLMP Revision (1997) refocused its biodiversity and population viability management strategies in ecological planning areas, and took a broader regional view. Recent efforts to further refine the process of biodiversity and population viability management led to the convening of an interagency committee on the subject. A brief description of each is presented below.

Old-growth areas identified in the Project Area for retention and extended rotation were mapped in the 1989-1994 Long-term Sale EIS (USDA Forest Service, 1989b). These previously mapped old-growth areas were selected to benefit wildlife by maintaining large blocks of unfragmented habitat and to serve visual management and other resource needs. They were in the greatest abundance along the lower Thorne River, Cutthroat Lakes and Control Lake, and north of Big Salt Lake.

The TLMP Draft Revision (1991a) provided for regional management and maintenance of population viability at the planning area level. An "analysis area" for defining viable populations is the ecological province (TLMP, 1991a). The Control Lake Project Area is included in one ecological province, the North Central Prince of Wales Island Province (TLMP, 1991a). This province includes all of Prince of Wales Island north of a line between Cholmondeley Sound to Hetta Inlet, as well as Sukkwan, Tuxecan, and Kosciusko Islands. Under TLMP, project areas are not expected to independently maintain viable populations, but to contribute to viable populations for the province. Standards and guidelines outline prescriptions for maintaining biodiversity at the project area level (TLMP, 1991a). A more detailed discussion of managing biological diversity can be found in the TLMP Draft Revision, 1991, Volume 149, Chapter 3 pages 9 through 45 and is incorporated here by reference.

An interagency committee appointed by the Forest Service was assembled (VPOP) to develop special standards and guidelines for some species associated with old-growth forests to ensure that their populations remain viable and well distributed across their current range on the Tongass National Forest (internal USDA Forest Service memorandum from J. Capp, Chair, Viability Steering Committee, August 22, 1992).

The VPOP committee focused on viability risk assessments that could be applied to the evaluation of planning alternatives (internal Forest Service memo from J. Capp, Chair, Viability Steering Committee, August 22, 1992) over large areas known as HCA's. The VPOP committee recommended HCA's of three sizes: large, medium, and small (Suring et al., 1992). The three different HCA's could be applied to individual planning areas or to multiple planning areas provided sufficient connecting corridors are present to permit dispersal of wildlife across HCA's.

For a large HCA, a tract should include at least 20,000 acres of old-growth with over 8 MBF per acre, including at least 10,000 acres with over 20 MBF per acre within a total area of at least 40,000 acres (Suring et al., 1992). Large HCA's should be no more than 20 miles apart, edge to edge, to ensure effective dispersal between them. HCA's with these characteristics are believed to be necessary to ensure that viable populations of wide-ranging species such as goshawk and marten are well distributed within a planning area.

A medium HCA would encompass at least 5,000 acres of old-growth forest with over 8 MBF per acre, including at least 2,500 acres of old-growth forest with over 20 MBF per acre within an area of at least 10,000 acres. Medium HCA's would be capable of supporting at least 5 female martens during winters of poor prey and 2 pairs of goshawks (Suring et al., 1992).

Small HCA's would encompass at least 800 acres of old-growth forest having over 8 MBF per acre within an area of at least 1,600 acres. Small HCA's would be capable of supporting at least 1 female marten during winters of poor prey (Suring et al., 1992). Small HCA's are maintained to provide temporary functional habitat for wildlife dispersing between large and medium HCA's. The small HCA's also contribute to the landscape matrix between large and medium HCA's.

Under the new Forest Plan (1997), an expanded old-growth conservation strategy consists of two basic components: (1) a forest-wide reserve network, and (2) a matrix management strategy. The forest-wide reserve network protects the integrity of the old-growth forest. It includes a series of large, medium, and small old-growth reserves. In the Control Lake Project Area, a large old-growth reserve encompasses the Honker Block and extends west to the project boundary. Small reserves are located in the Rio Beaver watershed, Rio Roberts watershed, and the Election Creek watershed. Old growth will also be protected in other non-development LUD's including the Semi-remote Recreation LUD on the Western Peninsula, the Rio Roberts Research Natural Area near the mouth of Rio Roberts Creek, and the Wild and Scenic River LUD along the Thorne River and Hatchery Creek.

The second component of the old-growth conservation strategy is management of lands with LUD allocations where commercial timber harvest may occur. Harvest of old growth is restricted by standards and guidelines including the 1,000-foot beach and estuary fringe, riparian buffers; other standards and guidelines restrict harvest on high-hazard soils, steep slopes, karst terrain, visually sensitive travel routes and use areas, and timber stands not technically feasible to harvest. Refer to the analysis presented in the new Forest Plan (USDA Forest Service, 1997), including Appendix N, for more detailed information.

This page left intentionally blank

Lands

Key Terms

Alaska Native Claims Settlement Act (ANCSA)—provides for the settlement of certain land claims of Alaska Natives.
Encumbrance—a claim, lien, charge, or liability attached to and binding real property.
Native selection—application by Native corporations to the USDI Bureau of Land Management for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA.
Special use permits—permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.
State selection—application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Introduction

Before 1971, the Ketchikan Area land base of the Tongass National Forest was fairly stable. There were only minor changes, such as the transfer of National Forest System lands to private homesites, canneries, and townsites. Beginning in the early 1970s, Federal legislation, including the ANSCA and the ANILCA, caused significant land ownership changes.

The Federal government owns the majority of the land in the Project Area (Figure 3-25); the Forest Service manages this land as part of the Tongass National Forest. The Forest Service administers 86 percent of the land within the Project Area, although there are areas owned by other entities. The State of Alaska owns or has selected less than 1 percent of the land. State lands are used for a variety of purposes. Approximately 10 percent of the land in the Project Area is privately owned, including land owned by the Sealaska Corporation. Sealaska land is used primarily for timber production. Timber management recreation, subsistence, and fish/wildlife habitat are the primary National Forest use within the Project Area.

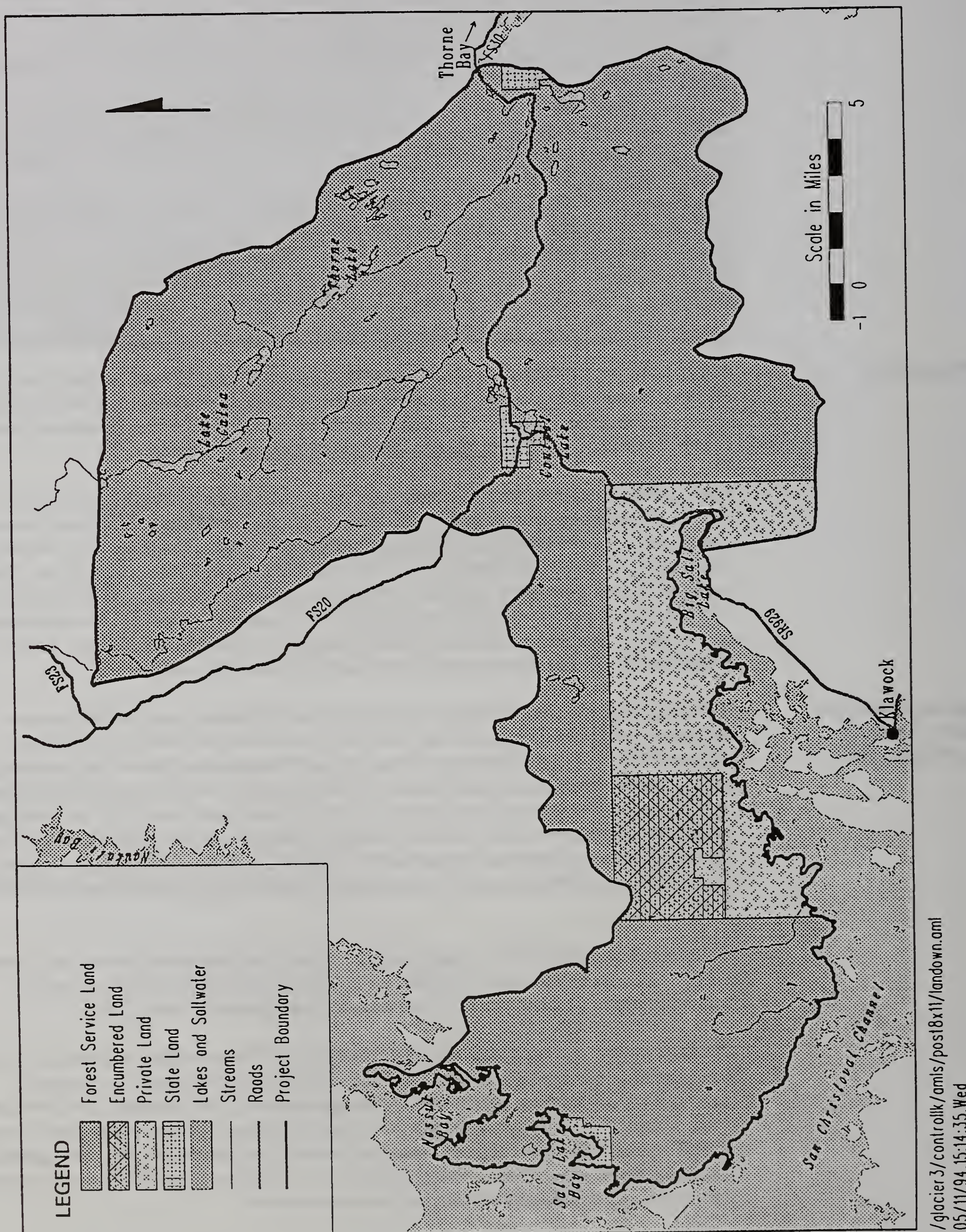
State and Native Lands, Claims, and Allotments

The Alaska Statehood Act of 1959 authorized the state of Alaska to select 400,000 acres of National Forest System lands in Alaska. To date, approximately 84 percent of the State's entitlement has been conveyed by the Bureau of Land Management. Most of the remaining land has been selected and is in the process of being conveyed. ANILCA gave the State until 1994 to complete its selections and permits the State to select lands in excess of its remaining entitlement. Because the State of Alaska can select more land than it is entitled to receive via conveyance, some of these lands might become available for National Forest harvest as the State removes lands from the selection list to get the total amount of land selected to 400,000 acres.

As illustrated in Figure 3-26, the State owns several parcels of land in the Project Area. State land is located at the south end of Big Salt Bay, on the west side of Control Lake, south of Kogish Mountain, west and north of Sealaska land, and northeast of Angel Lake.

ANCSA provided for conveyance of certain lands to the 10 Native village corporations, the two Native urban corporations, and the one Native regional corporation located in Southeast Alaska. These corporations are entitled to select approximately 550,000 acres of land from the Tongass National Forest. About 83 percent of these lands have been conveyed to the corporations. The U.S. Department of Interior and the Bureau of Land Management issued regulations authorizing these corporations to select lands in excess of their entitlement. However, as with State selections, only the actual entitlement will be conveyed.

Figure 3-26
Land Ownership/Management in the Project Area



In the Project Area, the Sealaska Corporation owns approximately 27,500 acres. The Sealaska land is located to the north, east, and south of Shinaku Inlet and Big Salt Lake. The land has been used primarily for timber harvest, and harvest activities continue today.

Other Land Use Issues

Timber Management on Non-National Forest System Lands

National Forest System lands within and near the Project Area have been conveyed to both the Sealaska Native Corporation and the State of Alaska. Substantial timber harvest has occurred on these lands. If the rate of recent harvest activities continue, it could be assumed that much of the remaining timber on Native Corporation-owned land would be harvested in the near future.

Mining Claims

For information concerning mining claims in the Project Area, see the *Geology, Minerals, and Caves* section.

Special Use Permits

Recreational Special Use Permits in the Project Area are discussed in the *Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas* section. The only Nonrecreational Special Use Permit in the Project Area is for a lodge (the Boardwalk Wilderness Lodge) located near Thorne Bay.

Comprehensive Plans

Prince of Wales Area

The Prince of Wales Area Plan proposes guidelines for how State-owned lands should be managed within the Prince of Wales planning area (ADNR 1988). The plan describes where the State proposes to select additional lands from the Tongass National Forest, prioritizes the location and timing of future land disposals, indicates where log transfer and storage areas may be located on State tide and submerged lands, and designates areas especially important for fish and wildlife habitat and harvest. It also sets guidelines for uses that occur on State lands. Area Plan guidelines likely to be applicable to units within the Project Area include coordination and public notice, fish and wildlife habitat, floathomes, forestry, public access, recreation, tourism, cultural and scenic resources, settlement, shoreline development, and subsurface resources.

Shoreline Management Program/Coastal Zone Management Act of 1976

Congress passed the CZMA in 1976 and amended the law in 1990. This law requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The state of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for determining consistency of activities within the coastal zone.

The Forest Service is working with the Alaska State Division of Government Coordination on a revision of the MOU between the State and the Forest Service. Standards against which the consistency evaluation will take place are: Alaska Statute Title 46; Water, Air, Energy, and Environmental Conservation and the Alaska Forest Practices Act of 1990.

Alaska National Interest Lands Conservation Act of 1980

Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action may significantly restrict subsistence opportunities. The *Subsistence* section of this chapter and Galginaitis (1994) contain a substantive discussion of ANILCA.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper signed into law a major revision of Alaska's Forest Practices Act. The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act also affects National Forest management through its relationship to the Alaska Coastal Management Program and the Federal CZMA (see above discussion).

For National Forest timber operations, such as proposed for the Control Lake Project, the effect of the revised Forest Practices Act is essentially twofold. First, it clarifies that the revised Forest Practices Act is the standard that must be used for evaluating timber harvest activities on Federal lands to determine consistency with the Alaska Coastal Zone Management Program. Second, it calls for minimum 100-foot buffers on all Class I streams, and it recognizes that consistency with the Alaska Coastal Management Program can be attained in Federal timber harvest activities by using methodologies that may differ from those required by the revised Forest Practices Act or its implementing regulations.

The TTRA prohibits commercial timber harvesting within buffer zones established on all Class I streams and those Class II streams that flow directly into a Class I stream. Buffer zones are a minimum of 100-foot slope distance from the edge of either side of the stream. The Forest Service is working with the Alaska State Division of Government Coordination on a revision of the MOU between the State and the Forest Service. This revised MOU will establish the policies and procedures for coordinating State review of Forest Service programs and activities, including those covered by the Forest Practices Act and the Alaska Coastal Management Program.

Transportation and Facilities

Key Terms

A-frame LTF—log transfer facility system which consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.
Access management—the designation of roads for differing levels of use by the public.
Aquatic Habitat Management Unit (AHMU)—mapping unit that displays an identified value for aquatic resources; a mechanism for carrying out aquatic resource management policy.
Arterial roads—roads usually developed and operated for long-term land and resource management purposes and constant service.
Endless chain LTF—log transfer facility system which consists of a gravity slide ramp for sliding log bundles into the water, with a chain assist system to slow the velocity of logs entering the water.
Collector roads—roads that collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.
Local roads—roads that provide access for a specific resource use activity such as a timber sale or recreational site; other minor uses may be served.
Log Transfer Facility (LTF)—a facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.
Main trunk roads—primary roads that are used repeatedly for forest access over long period of time.
Maintenance levels—levels at which roads are maintained (or closed) for various uses, including high-clearance vehicle and passenger vehicle use. See Glossary for more detail.
Modular bridge—a portable bridge constructed of components that can be readily assembled and disassembled for movement from one site to another.
Specified roads—a road, including related transportation facilities and appurtenances, shown on the Sale Area Map and listed in the Timber Sale Contract. These roads are constructed as permanent roads as part of the forest development transportation system.
Temporary roads—short term roads built for limited resource activity or other project needs.
Traffic service levels—traffic characteristics and operating conditions that are used in setting road maintenance levels.

Transportation

Access to Prince of Wales Island and the Control Lake Project Area is by small plane, ferry, and boat. A ferry terminal for the State of Alaska Marine Highway System is located at Hollis south of the Project Area. The road network on Prince of Wales Island originally developed as a result of timber harvest starting in the mid-1950s. Forest Road 30 leads west from Thorne Bay to the Control Lake junction. The road extends south to Klawock and Craig and north to Naukati. Roads extend from Forest Road 30 into the Rio Beaver Watershed and into the Honker Divide area. South of the Control Lake junction the road system enters the Steelhead Creek drainage. Private roads accessing private land extend off this road system west along Big Salt Bay. On the western part of the Project Area the road system extends south from the Staney Creek watershed into the northern portion of the Western Peninsula.

Currently, timber harvested from National Forest System lands on the north or western part of the Project Area is hauled to Coffman Cove, Naukati, or Winter Harbor. Timber harvested in the central Project Area is transported to Thorne Bay. Opportunities to use private road systems that touch the Project Area exist through a user fee agreement. Specifically, the private road system along Big Salt Bay provides access to the Kogish Mountain Area.

The Forest Transportation System includes three types of roads: arterials, collectors, and locals. Arterial and some collector roads are usually maintained for use by passenger vehicles and are normally designed for higher truck speeds than local roads. Forest Road 30 is considered an arterial while the main branches from it are collectors. Local roads provide access to individual harvest units and recreation sites.

Table 3-33 shows the total miles of road and road density by VCU for the Project Area. Road density is calculated by dividing the miles of road by the total area in square miles of the VCU. There are 169 miles of road within the Project Area. Road density varies from 0 to 0.88 miles of road per square mile of area. No roads exist in the Rio Roberts Watershed, in a large part of the central Honker Divide, and on most of the Western Peninsula.

Table 3-33
Existing Roads and Road Density for the Control Lake Project Area

VCU	Existing Roads (Miles) Arterial	Collector	Local	Total	Road Density (mi/mi^2)
574	0	0	0	0	0.00
575	0	3.8	1.9	5.7	0.20
576	2.7	4.5	2.3	9.4	0.39
577	0	1.2	4.0	5.2	0.22
578	0	1.7	4.0	5.7	0.56
591	0	0.1	0.4	0.5	0.04
593	0	0	0	0	0.00
594	0	0	3.0	3.0	0.10
595	0.4	0.3	7.9	8.6	0.22
596	3.3	4.0	2.7	10.0	0.49
597	4.0	3.9	26.5	34.4	0.88
TOTAL	10.4	19.5	52.7	82.5	0.26

SOURCE: USDA Forest Service, Ketchikan Area GIS Database.

Post-Harvest Maintenance and Access Management

Maintenance levels are based on anticipated road use. The maintenance levels also incorporate traffic service levels and access management. Traffic service levels are displayed in Appendix E. Applicable maintenance levels for the Project Area are:

- Maintenance Level 1 (Traffic Service Level D)—Roads are closed by bridge removal or organic encroachment and are monitored for resource protection. Basic custodial maintenance is performed to perpetuate the road and to facilitate future management activities.

- Maintenance Level 2 (Traffic Service Level C)—Roads are maintained for high-clearance vehicles and monitored for resource protection. Traffic is normally minor, usually consisting of administrative or recreational uses.

- Maintenance Level 3 (Traffic Service Level B)—Roads are maintained for travel by a prudent driver in a standard passenger vehicle and are subject to the provisions of the Highway Safety Act. Road use is by administrative and passenger vehicles, and logging trucks.

Post-harvest access management of forest roads are utilized where necessary to control any class or type of traffic. Use is managed to prevent damage to the roadway, and to meet management direction for wildlife and recreational objectives. The road along the east side of the Thorne River is closed to public use. The following access management categories apply:

- Encourage—Motor vehicle use is encouraged by appropriate signing, public notification, and active maintenance of the road prism.

- Accept—Motor vehicle use is allowed but not encouraged, while the road is maintained for administrative access.

- Discourage—Motor vehicle use is discouraged by allowing alder growth at road entrance, nonremoval of blowdown, or road prism deterioration within acceptable environmental limits (depending on designated maintenance level). To discourage use, the road may also be signed as "Not Maintained for Motor Vehicle Traffic."

- Eliminate—Motor vehicle use is eliminated by physically blocking the road. Where prescribed for long-term intermittent roads, this strategy is achieved by placement of impassable barricades at road entrances. On short-term roads, removal of drainage structures effectively blocks vehicle traffic.

- Prohibit—Motor vehicle use is prohibited by a road order (CFR closure). Implementation of this strategy on remote road systems may require the installation of gates, in addition to public notification and appropriate signing.

- Prohibit Seasonally—Road is closed to motor vehicle use at times during the normal operating year. For all alternatives, seasonal prohibitions will be used as necessary to mitigate impacts to wildlife and subsistence resources (e.g., closure during either-sex deer hunting season). Administrative and permitted use of the roads will continue during closure periods, but only for specific permitted uses. Seasonal closures may be used in combination with cooperative efforts with fish and game protective agencies.

Logging Camps

There are no logging camps in the Control Lake Project Area.

Forest Service Facilities

There are no Forest Service administrative sites in the Project Area. The Thorne Bay Ranger District is located a few miles outside the eastern Project Area Boundary.

Log Transfer Facilities

The transfer of harvested timber requires that logs be removed from trucks, placed in salt water, and rafted or barged to their destination. There are no LTF's in the Control Lake Project Area. LTF's adjacent to the Project Area are located at Winter Harbor, Naukati, Coffman Cove, and Thorne Bay. These LTF's operate under existing permits.

This page left intentionally blank

Economic and Social Environment

> ***Key Terms***
>
> ***Cant***—a log partly or wholly cut and destined for further processing.
> ***Discounted benefits***—the sum of all benefits derived from the Project Area over the life of a project.
> ***Discounted costs***—the sum of all costs incurred from the Project Area during the life of the project.
> ***Present Net Value (PNV)***—the difference between total discounted benefits and total discounted costs associated with the alternatives calculated at a 4 percent discount rate.
> ***Discount rate***—the rate used to adjust future benefits or costs to their present value.

Introduction

Nearly 80 percent of Southeast Alaska is within the Tongass National Forest, an area larger than the state of West Virginia. This area stretches roughly 500 miles from Ketchikan in the southeast to Yakutat in the northwest, and is mainly unpopulated wild country. Approximately 65,000 people live in 33 towns, communities, and villages located in or near the boundaries of this, the largest forest in the National Forest System.

The economies of most communities in Southeast Alaska depend almost exclusively on the Tongass National Forest to provide natural resources for uses such as fishing, tourism, recreation, timber harvesting, mining, and subsistence. There is very little private land to provide these resources. Consequently, maintaining the abundant natural resources found on the Tongass concerns those who make their living there.

In addition to its economic value, the importance of the Tongass lies in its general enhancement of the quality of life. Southeast Alaska is regarded as a wild and magnificent place, a vast expanse of seemingly limitless scenery and abundant natural resources. Many Southeast Alaskans want to preserve their local environment while maintaining their economic livelihood. With a limited resource base, resolution of this conflict is becoming increasingly difficult.

Southeast Alaska Regional Economy

The export of fishery and forest products, the sale of North Slope oil, and the accommodation of out-of-state tourists dominate Alaska's economic output. Because it is largely an export-oriented economy, Alaska depends heavily on global macroeconomic conditions, particularly those of Japan and the other Pacific Rim countries.

The public sector plays an important role in the region's economy. The level of oil royalties returned to the State from Federal leases of offshore tracts heavily influences State and local government employment. Fishery products (38 percent), oil and gas (23 percent), and wood products (10 percent) led Alaska's trade in 1986 (Forest Service, 1992). Because of the rise in world oil prices from 1978 to 1982, Alaska's economic output increased faster than that of the United States during the same time period. In 1983, however, the sharp rise in the value of the dollar began cutting deeply into the competitiveness of Alaskan exports. By 1985, the precipitous fall in the price of crude oil and the rise in the value of the dollar decimated Alaskan exports, reducing, in turn, the Gross State Product (Forest Service, 1990).

Alaska's exports of forest products go principally to Japan. As such, exports of timber and wood products greatly depend on the Japanese demand for wood products as well as the relative strength of the yen with respect to the dollar.

Local communities understand the dependence of the region's economy on foreign demand. This economic vulnerability increases the desire to both broaden the base of economic activity and stabilize the existing job market by ensuring a continuing supply of resources. Although employment fluctuations over the business cycle are unavoidable, economic diversification reduces fluctuations driven by outside forces beyond the fiscal and monetary influence of local and national policymakers.

Region of Influence

The Primary Region of Influence (ROI) is that area whose population would sustain the greatest socioeconomic impact from implementing of any of the proposed timber harvest alternatives in the Control Lake Project Area. The Primary ROI for this analysis, based on regional spending, consumption, and residential characteristics, is Prince of Wales Island. Fish and wildlife, timber, and to a lesser extent recreation opportunities are the major economic resources. Overlapping segments of the population located in varying proximity to the Project Area use, process, and/or consume each resource.

Craig, Klawock, Thorne Bay, and Hydaburg are the four most populated communities in the Primary ROI. Their combined total population is approximately 2,950 (USDC, 1992). The different employment and demographic patterns within these four communities presents a complete picture of possible socioeconomic impacts and of their significance on different types and sizes of communities within the Primary ROI. This EIS also addresses the demographic and socioeconomic characteristics of the towns of Coffman Cove, Kasaan, and Hollis because of their proximity to the Project Area.

The Extended Primary ROI is the area whose population would sustain the largest indirect economic impact from socioeconomic changes in the Primary ROI. Based on regional consumption and employment patterns, the analysis shows that the Ketchikan Gateway Borough would experience the greatest concentrated indirect economic impacts resulting from implementation of any of the proposed timber harvest alternatives. These effects would fall primarily on the city of Ketchikan, the largest regional distribution center of consumer goods and services in proximity to the Primary ROI.

The Secondary ROI includes the entire state of Alaska, other Pacific Northwest states, and countries having direct trade with the Primary and Extended Primary ROI's. Economic impacts on the Secondary ROI from implementation of any of the timber harvest alternatives in the Control Lake Project Area are expected to be negligible, therefore, they will not be discussed further.

Economic Use of the Forest

Wood products, salmon harvesting, and recreation including tourism dominate the economic activities of the communities analyzed in this EIS; all these industries exist within the extended Primary ROI. Each is tied directly and indirectly to the use of the forest. Table 3-34 displays 1994 employment information for these and other resource dependent industries. Recreation and tourism provides the highest direct employment, followed by wood products. The direct employment generated by resource dependent industries results in a labor force of 8,683, or almost 25 percent of the regional employment.

Each of these industries interacts with other sectors of the economy and includes several components. The timber industry directly affects several economic sectors including heavy

construction, lumber and paper products, and water transportation. The commercial fishing industry includes harvesting, processing, manufacturing, support, and transportation of fish and related products. The recreation and tourism industry includes guides and outfitters, tours and transportation services, and sport hunting and fishing support services. It directly affects the retail trade, service, and transportation sectors. Each key industry is discussed below.

Table 3-34

Direct Employment in Resource Dependent Industries and Southeast Alaska Total

Industry	1994 Direct Employment	1994 Total Employment
Wood Products	2,204	3,439
Mining	163	284
Recreation and Tourism	2,771	3,664
Salmon Harvesting	1,889	2,697
Seafood Processing	1,646	3,160
Resource Dependent Total	8,683	-
Southeast Alaska Total	37,107	37,107

Source: Forest Service, 1996

Timber Industry

History and Overview

Prior to 1950, the timber industry was a small portion of Southeast Alaska's economy. Sawmills existed at such places as Juneau, Petersburg, Wrangell, and Ketchikan; a plywood mill operated at Juneau and a pulp mill at Port Snettisham (south of Juneau). The mills produced lumber for building construction, mine timbers, fish traps, and salmon packing crates. During World War II, aircraft construction created a high demand for Sitka spruce. Since 1950, the timber industry has become a major economic and social factor in Southeast Alaska.

The industry's structure in Southeast Alaska has changed significantly over the last decade. In 1980, the major focus of the industry was processing timber from the Tongass National Forest into cants and dissolving pulp. Sawmills processed primarily large-diameter spruce logs, sawing them just enough to meet the minimum Federal export standards. The smaller or defective spruce logs and most of the hemlock logs were chipped for pulping. Today, the forest products industry in Southeast Alaska processes spruce and hemlock logs of varied diameter into finished lumber products. They also chip and sell the wood wastes from the sawing process. In addition, Asia has become a new market for logs from lands conveyed to Alaska Native corporations under ANCSA (P.L. 92-203).

The result of Southeast Alaska's heavy economic dependence on overseas exports of timber and timber products is an unusually high economic sensitivity to fluctuations of exchange rates, foreign demand for wood fiber, and competition among timber suppliers outside the Tongass National Forest. The historic timber industry employment in Southeast Alaska and its fluctuations is shown in Table 3-35.

Sawmills operating today in Southeast Alaska include the Annette Hemlock mill, Chilkoot Lumber Company (Haines), KPC Ward Cove mill (Ketchikan), and Viking Lumber. Seventeen smaller mills operate periodically; most of these mills process less than 1 MMBF annually. They produce finished lumber, cants, flitches (sawn logs and cants from which veneer slices are made), baby squares (small, rough-sawn, squared timbers), and chips (Forest Service, 1990).

No pulp mills are currently operating in Southeast Alaska. The Alaska Pulp Corporation mill in Sitka closed in 1994. The KPC pulp mill at Ward Cove near Ketchikan closed in early 1997. KPC produced dissolving pulp for both domestic and export markets. Fifty percent of the timber harvested from Southeast Alaska (primarily western hemlock) was formerly used for pulp. National Forest, Native corporation, and State of Alaska lands are the sources of pulpwood.

The other players in the timber market of Southeast Alaska are the 13 Native corporations that export unprocessed logs. Between 1984 and 1989, the harvest on Native corporation lands increased almost 300 percent, from 209 MMBF to 613 MMBF. Unprocessed log exports have displaced cants in the export markets.

Timber Supply and Markets

The main sources of timber in Southeast Alaska are National Forest and Native corporation lands. By regulation, the primary use of timber harvested on Federal land is domestic manufacture into products such as pulp, lumber, or chips. There are exceptions to this rule. For example, when the supply of Alaska cedar exceeded domestic needs, it could be exported under permit as unprocessed logs. Western red cedar logs currently may be exported until a competitive market exists. Timber harvested from private lands may be exported as unprocessed logs.

Table 3-35

Southeast Alaska Timber Production and Employment 1984 to 1994

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1992	1994
Timber Production											
(MMBF)	575	500	589	734	808	1,014	997	841	899	766	602
Employment (Average Annual)											
Logging	946	1,004	1,239	1,545	1,981	2,113	2,144	1,554	1,415	1,344	1,177
Sawmills	395	363	331	375	468	478	500	604	538	447	515
Pulp mills	700	580	772	861	892	925	899	911	910	859	533
Total Direct	2,041	1,947	2,342	2,781	3,341	3,516	3,543	3,069	2,863	2,650	2,225
Indirect and Induced	1,143	1,090	1,312	1,557	1,871	1,969	1,984	1,719	1,603	1,484	1,246
Total	3,184	3,037	3,654	4,338	5,212	5,485	5,527	4,788	4,466	4,134	3,471

Source: Forest Service, 1996

As Table 3-35 indicates, the timber harvest in Southeast Alaska fluctuated somewhat in the 1980s and has steadily declined in the 1990s. One of the primary reasons for the fall in timber harvest in the early to mid-1980s was the precipitous increase in the value of the dollar. This caused overseas demand for Alaskan timber to fall, resulting in reduced production. A clear correlation can be drawn from the timber harvest fluctuations to timber industry employment throughout the 1980s.

Alaska's timber industry depends primarily on export markets in Japan and, to a lesser extent, other Pacific Rim countries including Taiwan, Thailand, Indonesia, South Korea, and the People's Republic of China. Domestic markets also are important; mills in Southeast Alaska ship timber to east coast and midwestern states. Alaska's major competitors in the export market are British Columbia, Pacific Northwest states, Russia, and New Zealand. The fortunes of the timber industry of Southeast Alaska are closely tied to the yen and dollar exchange rate, a stable Japanese market, and housing starts in Japan.

A growing market for products made from both natural and synthetic materials has stimulated demand for dissolving pulp. Also, when demand was ebbing during the early 1980s, one dissolving pulp mill in Japan closed and a number of the newer Third World mills switched to production of other types of pulp, thereby reducing competition.

Wood chips being transported to market

Timber-related Employment in Southeast Alaska

The Tongass timber program is part of a long-term effort to provide greater economic diversity and more stable, year-round employment in Southeast Alaska. To achieve that goal, the Forest Service established requirements to process National Forest System timber in Alaska, and entered into long-term contracts to encourage the development of an integrated timber manufacturing industry. These contracts were established under provisions of the Tongass Timber Act of 1947. Providing sufficient timber supply opportunities to maintain timber-related employment in Southeast Alaska was an objective of TLMP and Section 705(a) of ANILCA.

Basic industries in Southeast Alaska (industries geared for exports outside of the Southeast Alaska region) include forest products, seafood, mining, tourism, the Federal government where it serves a national or regional function, and state government where it serves a statewide function. The forest products industry accounted for 19 percent of the basic industry employment (Forest Service, 1990). When employment in related National Forest management activities was included, the figure climbed to about 25 percent (Forest Service, 1990).

In the 1980s, timber harvest and forest products manufacturing provided 12 percent of the region's wage and salary employment, with the timber from the Tongass supporting about 7 percent of the region's jobs (Forest Service, 1990). From 1984 through 1994, these timber

harvest and forest products activities supported from 3,037 to 5,527 jobs in Southeast Alaska (Table 3-35). During the 1980s and early 1990s, approximately 60 percent of the timber harvested in Southeast Alaska came from land administered by the Forest Service (Forest Service, 1990). Direct employment in Southeast Alaska's timber industry has declined steadily since 1990. Contributing significantly to this decline has been the shutdown of the Sitka Pulp Mill and the Wrangell Saw Mill in 1994. These closures resulted in a loss of 700 and 200 jobs, respectively. This employment loss was equivalent to 17 percent of timber industry employment in Southeast Alaska in 1991. Closure of the KPC pulp mill will have an additional effect on employment in the Ketchikan Area. These employment losses will have further negative repercussions as a result of the increased strain placed on the regional social welfare network, and the overall reduction in level of economic activity resulting from reduced timber processing and salary expenditures.

Receipts and Payments

Table 3-36 shows the total receipts from the Tongass timber program along with payments from those receipts to the state of Alaska. In all years except 1987, 25 percent of all revenues (including purchaser road credits) from the Tongass were paid to the state of Alaska (Forest Service, 1990). The State uses the funds for public schools and roads. The amount of timber program funds to date has not constituted a significant portion of the total public schools and public road budgets for the cities and boroughs of Southeast Alaska.

Table 3-36

Forest Receipts and Payments to the State of Alaska, Fiscal Years 1980 to 1992

Year	Tongass Receipts1/	Payments to Alaska
1980	$26,024,494	$6,506,124
1981	$15,007,944	$3,751,986
1982	$21,622,764	$5,405,691
1983	$5,365,915	$1,341,479
1984	$4,063,189	$1,015,797
1985	$209,231	$52,308
1986	$1,967,240	$491,810
19872/	$-2,033,575	—
1988	$1,232,672	$308,168
1989	$20,183,133	$5,045,783
1990	$36,010,243	$9,057,119
1991	$36,968,718	$9,242,179
1992	$13,093,312	$3,273,328
Total	$179,715,2803/	$45,491,772

Source: Forest Service, 1993c.

1/ Capital investments such as permanent roads, bridges, log transfer facilities, and timber stand improvements also contribute to the total assets of the Tongass National Forest, reduce future management costs, and are scheduled to achieve management objectives described in TLMP.

2/ Tongass receipts for Fiscal Year 1987 were negative because of Comptroller General Decision B-224730 of March 31, 1987 to retroactively implement the emergency rate redetermination for short-term sales. Without the reduction, Tongass receipts would have been positive by $2,139,943. As a result of the negative receipts, no payments to the State were made in 1987.

3/ Does not include receipts foregone as a result of the Federal Timber Contract Payment Modification Act. Estimated total value of affected contracts was approximately $54.5 million prior to the Act if all volume was harvested. Total value of the affected contracts as a result of the Act was approximately $1.2 million. The difference of $53.3 million represents receipts foregone; thus, the total Tongass receipts from Fiscal Years 1980 to 1988 would have been $126.8 million.

Commercial Fishing Industry

Although continually fluctuating, the commercial fishing industry remains a major component of Southeast Alaska's economy (Table 3-37). Alaska's commercial fisheries increasingly have been regulated, thus stabilizing fish harvest employment. For example, a permit system regulates the number of salmon harvesters and individual quotas regulate halibut harvest. Since 1980, changes have occurred with seafood processing, also a vital component of Southeast Alaska's economy. Greater use of floating fish processing facilities and a trend toward frozen rather than canned salmon are among the most significant of the changes.

Table 3-37
Southeast Alaska Salmon Harvesting and Seafood Processing Direct Employment (Average Annual Jobs)

Year	Salmon Harvesting Jobs	Seafood Processing Jobs	Total Direct Employment
1984	1,901	1,419	3,320
1985	1,928	1,439	3,366
1986	1,915	1,429	3,345
1987	1,931	1,158	3,089
1988	1,962	1,392	3,354
1989	1,894	1,379	3,273
1990	1,892	1,408	3,300
1991	1,939	1,475	3,414
1992	1,870	1,396	3,265
1993	1,896	1,550	3,446
1994	----	1,646	----

Source: Forest Service, 1996

Having recovered from low levels in the early 1970s, salmon continues to dominate the industry in volume and value of catch and in harvest-related employment. Forest Service estimates suggest that from one-half to two-thirds of the fish used by the fish-processing industry are salmon. Assuming employment in the industry is proportional to some combination of the values and volumes of fish processed, an estimated one-half to two-thirds of the industry's employment depends on salmon.

National Forest System habitats produce much of the salmon harvested in Southeast Alaska's fisheries. Assuming habitat is proportional to ownership of timberland in Southeast Alaska, the Tongass National Forest may contribute up to an estimated 80 percent of the regional salmon harvest. This assumes that the number of hatchery-reared stock in the harvest is minor and the combined catch of hatchery stocks, wild stocks originating outside Southeast Alaska, and wild stocks reared on private or State lands are approximately 20 percent of the total harvest.

The anadromous fish reared in habitat on National Forest System lands in Southeast Alaska support approximately 1,850 jobs (or more than 50 percent of employment) in the commercial fishing and fish-processing sectors. Another 700 are assumed to be employed in the retail, service, supply, and construction sectors (Forest Service, 1990) supported by the business

purchases and personal consumption expenditure patterns of the fishers and fish processors. An estimated 9 percent of the region's population depends on the harvest of salmon spawned in the National Forest in Southeast Alaska. Individual communities may have a higher degree of dependence. Commercial fishing and processing work supplements the income of some families rather than providing their principal source of earnings. For other families, income from fishing or cannery work is the only cash supplement to an otherwise subsistence lifestyle.

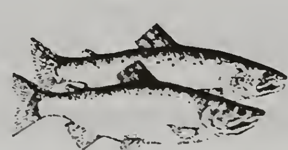
Recreation and Tourism Industry

During the 1980s, tourism became a major industry in Southeast Alaska. Cruise ships traveled the Inside Passage in record numbers, making regular stops at Southeast ports. Between 1980 and 1986, the number of cruise ship passengers increased by nearly 90 percent. Total numbers of visitors to Southeast Alaska grew from 205,000 in 1983 to 350,000 in 1986 (Forest Service, 1990). The tourist season also expanded to include much of May and September. Marketing studies by the Alaska Division of Tourism indicate "scenery, forest, mountains, out-of-doors" and "wilderness, unspoiled, rugged" were the top interests of potential visitors (Forest Service, 1990). Fishing and hunting license sales indicate that recreation activities by Alaska residents also increased during the 1980s. Table 3-38 summarizes recreation and tourism-related trends between 1984 and 2010.

Table 3-38
Tongass Related Recreation and Tourism Consumption and Employment—Historical and Projected

Year	Consumption (1,000 Recreation Visitor Days)	Direct Employment (Jobs)
1984	987	730
1985	1,463	1,082
1986	1,073	793
1987	1,315	972
1988	1,487	1,100
1989	1,738	1,285
1990	2,303	1,703
1991	2,435	1,801
1992	2,554	1,889
1993	2,071	1,532
1994	2,165	1,601
1995	2,642	1,954
2000	3,361	2,154
2005	4,080	2,351
2010	4,800	2,548

Source: Forest Service, 1996.



Unlike other industries, tourism and recreation is not a single industry but a composite of many that serve more than tourists. For example, the retail trade, service, and transportation industries serve local industries and residents as well as tourists. Tourism and recreation-related jobs tend to be highly seasonal and low-paying.

An estimated 285 jobs in Southeast Alaska depend on spending by sport hunters. About 820 jobs in the region result from the purchases of sport anglers. Another 475 jobs result from the sport hunting- and fishing-related purchases made by businesses and their employees. In total, hunting- and fishing-related expenditures (excluding commercial fishing expenditures) produce approximately 6 percent of the region's wage and salary employment (Forest Service, 1990).

Demographics and Income

State of Alaska

Between 1960 and 1990, the population of the state of Alaska grew from 230,400 to 550,000, an increase of nearly 139 percent. Population growth has been relatively consistent throughout the 30-year period. Projections made in the mid-1980s show an estimated population of approximately 620,000 by 1995. However, according to 1990 Census data, population growth in the State has slowed down. Two of the primary factors in the slowdown appear to be the crude oil glut of the late 1980s, which resulted in production stabilization, and Japan's overabundant supply of timber. In both cases, demand for labor fell below projections, producing a lower than projected population influx.

The proportion of the population in Alaska living below the poverty line is higher than the rest of the nation (14 percent versus 12 percent). The average proportion of singles and single-parent households living in poverty is lower in the state of Alaska than nationwide. The heavy reliance on subsistence by many of Alaska's residents, particularly those of Southeast Alaska, may partially account for the proportionally higher ratio of entire families living beneath the poverty line. Those who rely on subsistence fishing and hunting accumulate goods without transferring money; thus, any accounting of such activity is difficult and highly inaccurate. The social and economic system among many who rely on subsistence fosters an unofficial parallel market driven by a "complementary" barter system. For example, a hunter will give his neighbor part of the game he caught as a gift. His neighbor, the fisher, will return the favor sometime in the future with a gift of some catch. The current measure of accounting used in establishing social and demographic statistics makes it difficult to accurately account for such transactions; therefore, a complete picture of the welfare of many of the residents of Alaska, particularly those of Southeast Alaska, does not exist.

Southeast Alaska—Tongass National Forest

The majority of communities in Southeast Alaska are small, isolated from one another, and accessed only by air or water. Only four communities in the region can be reached by land: Skagway, Haines, and Klukwan in the north, and Hyder in the south. Juneau, Alaska's capital with a population of nearly 24,000, is the largest community in Southeast Alaska. It is the only community with a population greater than 20,000 and represents 40 percent of the region's total population. The mid-sized communities in Southeast Alaska are Sitka and Ketchikan with approximately 12,700 and 8,200 residents, respectively. The combined populations of Juneau, Sitka, and Ketchikan make up approximately 70 percent of the total population of Southeast Alaska (USDC, 1992).

Southeast Alaskan communities show varying degrees of economic development and diversity. Fishing, timber, tourism, mining, and government are the major economic sectors; however, there is considerable local variability in the degree of importance of these activities. Some

communities have little or no local economy in the conventional sense and rely heavily on local fish and game resources. In these cases, sources outside the community supply goods and services that cannot be obtained from local subsistence. Some communities depend on a single economic activity while others enjoy greater economic variability.

Although Southeast Alaska's relative economic state is good, income and poverty levels throughout its various communities vary widely. The larger communities of Ketchikan, Juneau, Wrangell, Petersburg, and Sitka have income levels well above the national average, with a smaller percentage of the people living below poverty levels. In many of the smaller communities where reliance on subsistence is more pervasive, a higher proportion of individuals and families live below the poverty level. However, as previously noted, poverty rates in subsistence communities are somewhat deceiving because many people in these communities rely at least in part on hunting, fishing, gathering, and other forms of subsistence for their livelihood. There are, as a result, fewer actual financial transactions and less need for money.

Community Profile (Primary ROI)

The towns on Prince of Wales Island differ in population and economic profiles; therefore, the level and significance of any economic impacts which they may sustain will differ. Understanding some of their basic differences makes for a keener impact analysis. The examination of each of the following communities coupled with the socioeconomic impact analysis should allow the reader to infer the level and significance of potential economic impacts on other similar but smaller communities within the Primary ROI.

Prince of Wales Island

Located about 45 miles west of Ketchikan, with a population of approximately 3,500 (USDC, 1992), Prince of Wales Island is the third largest island within the jurisdiction of the United States. The four major communities on the island are Craig, Klawock, Thorne Bay, and Hydaburg; other communities of interest to the Control Lake Project include Naukati, Whale Pass, Coffman Cove, Hollis, and Kasaan. The island has been the site of several lumber mills and mining camps since the 1800s. However, it was the salmon harvest that led to its permanent settlement by non-natives. Klawock was the site of one of Alaska's first canneries, built in 1878 (see *Cultural Resources* section). Since then, 25 canneries to process salmon have been built on the island. Today, logging is dominant on the island. Most of the island is National Forest System land, although there are some Native corporation and private land holdings. In addition to timber harvesting and commercial and subsistence hunting and fishing, Prince of Wales Island offers both opportunities and adequate facilities to attract recreational tourists.

Craig

Craig is located on a small island connected to the western part of Prince of Wales Island by a short causeway (see Figure 1-1). The town can be accessed directly via its boat harbor and seaplane float. Craig was once a temporary fishing camp for the Tlingit and Haida people, natives of the region. It was named for its founder, Craig Miller, who in 1907, with the help of local Haidas, established a saltery at Fish Egg Island. Between 1908 and 1911, a permanent saltery and cold-storage facility and about two dozen homes were built at the town's present location. The town was incorporated in 1922 and continued to grow throughout the 1930s. Although the economic health of the salmon industry has fluctuated over the years, fishing still accounts for about half of the employment in Craig. In recent years, increased timber harvesting on the island also has provided jobs in logging and timber processing.

As the most populated town in the Prince of Wales Island Outer Ketchikan Census Area, Craig serves as the primary retail trade center on the island, and has a high proportion of federal, state, and local government jobs. With an estimated population of 1,260, it is home to approximately 30 percent of the island's population (Table 3-39). Overall, the demographic distribution of the town's population is similar to that of the State. These similarities include the male/female ratio, median age of residents, and ethnic mix of non-Native/Native residents (Table 3-39). The town's remote nature is such that its population base is younger and seems to be more transient than for the State overall. Although it is the social and economic center of Prince of Wales Island, it appears to have limited attraction for outside recreational tourists making prolonged visits. Craig's economic welfare, as a result, depends primarily on the stability of the direct employment, income, and subsistence that timber harvesting, fishing, and hunting offer its residents. To a lesser extent, Craig's economy depends on the economic health of surrounding towns whose residents make up a significant portion of the customer base for Craig's merchants.

Table 3-39

Selected 1990 U.S. Bureau of the Census Population and Housing Data (Extended Primary ROI)

	Alaska	Craig	City of Thorne Bay	Hydaburg	Klawock	Kasaan	City of Hollis CDP	Coffman Cove	Naukati	Whale Pass	Ketchikan
Total Population	550,043	1,260	569	384	722	54	111	182	93	75	8,263
Male (%)	52.7	53.1	53.8	57.0	54.9	48.2	55.0	64.0	68.8	57.3	51.8
Female (%)	47.3	46.9	46.2	43.0	45.1	51.8	45.0	36.0	30.2	42.7	48.2
Median Age	29.4	28.5	31.4	28.3	29.5	31.3	36.7	34.5	34.5	31.3	31.7
Total population under 18 (%)	31.3	34.1	34.4	35.4	32.0	33.3	29.7	25.8	20.4	34.7	27.5
Race and Ethnic origin (%)											
White	75.5	76.1	97.2	10.4	44.9	46.3	95.5	92.5	97.9	93.3	78.3
Black	4.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	4.0	0.0
Alaska Native	15.6	22.9	1.2	89.1	54.3	53.7	2.7	7.0	1.1	2.7	15.7
Hispanic	3.2	2.4	2.3	0.5	1.7	1.9	0.9	1.1	1.1	0.0	2.5
Median housing price	$94,400	$94,000	$56,700	$60,000	$75,900	$55,000	$50,000	$26,300	---	$27,500	$105,200
Median rent	$503	$533	$398	$231	$414	$338	$275	$271	$200	---	$530
Occupancy and tenure (%)											
Owner occupied	56.1	63.1	53.1	61.0	55.2	63.2	81.4	49.3	47.2	89.3	46.3
Renter occupied	43.9	36.9	46.9	39.0	44.8	36.8	18.6	50.7	52.8	10.7	53.7
Seasonal or occasional use	7.3	3.6	3.0	1.5	0.7	3.3	36.6	1.2	4.9	15.0	0.8
Mobile houses, trailers, other	10.6	58.1	48.5	11.1	45.9	20.0	11.3	81.5	82.9	30.0	7.1

SOURCE: USDC, 1992.

The continuing improvements to the Prince of Wales Island road system has had significant effects on Craig and other communities on the island. Craig's central location and proximity to the main road system gives its residents access to jobs and other Prince of Wales Island residents access to retail markets in Craig.

Thorne Bay

The city of Thorne Bay began as a logging camp in 1962 and was incorporated in 1982, making it one of Alaska's newest cities. Currently, the two largest employers in the town are

KPC and the Forest Service; the municipal government and a few local trades and services provide additional jobs. Although tourism is not a mainstay of the town's economy, Thorne Bay does offer recreational opportunities and accommodations for recreational visitors.

Thorne Bay depends heavily on logging and timber production; consequently, the town's demographic makeup differs from Craig and most other regional towns whose economies, although dependent on timber harvesting, are more diverse. The town's population was 569 in 1990 (USDC, 1992). Its ethnic distribution differs from that of Craig and the State. While Native communities compose nearly 23 and 16 percent of Craig and the State's populations, respectively, less than 2 percent of Thorne Bay's population is Native. The town's overwhelming dependence on timber harvesting has attracted a largely white population which tends to dominate the logging industry. The town's housing market reflects the transient nature of those involved in the logging industry. Over 80 percent of the homes in Thorne Bay are classified as mobile or trailer. The estimated median housing unit price is $56,700 (USDC, 1992), one of the lowest on the island. Table 3-39 provides a detailed breakdown of some demographic and housing characteristics of Thorne Bay.

Hydaburg

The town of Hydaburg was founded in 1911 by combining the populations of three Haida villages. Nearly 90 percent of its total population of 384 (USDC, 1992) is classified as Native (i.e., American Indian, Eskimo, or Aleut). The town's residents are involved primarily in commercial fishing. Many also engage in subsistence activities. Housing prices in Hydaburg are comparable to those of Thorne Bay (approximately 10 percent higher on average); however, unlike Thorne Bay, it's residents are generally not transient. Nearly 75 percent of the housing market consists of one-unit detached housing units. Table 3-39 provides demographic and housing characteristics for Hydaburg.

Klawock

Klawock was originally a Tlingit Indian summer fishing village that served as a trading post and was home to a salmon saltery, both established in 1868. A salmon cannery was built 10 years later—the first cannery in Alaska and the first of several cannery operations in the area. Like other Southeast communities, the population of Klawock has fluctuated with the salmon harvest. The local economy still depends on fishing and cannery operations, along with logging and sawmilling. However, it is becoming more of a retail and service center and maintains a growing recreation-based industry including lodges and fishing guides. Of its 722 residents, approximately 55 percent are Natives. See Table 3-39 for a breakdown of some demographic and housing characteristics of Klawock.

Kasaan

Kasaan is a small village at the head of Kasaan Bay on the east coast of Prince of Wales Island. It is one of a few villages on the island not connected by road. A local road system radiates out from the community; as the island's road network expands with new secondary logging roads, the town eventually will be connected to the road network. Its population of 54 (USDC, 1992) is almost evenly divided between Natives (54 percent) and non-natives (46 percent). The town's residents lead a predominantly subsistence lifestyle. Median housing prices in Kasaan are $55,000; approximately 20 percent of the housing stock is trailers. See Table 3-39 for a detailed breakdown of some demographic and housing characteristics of Kasaan.

Hollis

Hollis was a mining town with a population of about 1,000 from about 1900 to 1915. In the 1950s Hollis became the site of a KPC logging camp. It served as the base for KPC timber operations on Prince of Wales Island until 1962, when the camp was moved to Thorne Bay.

Recent State land sales have spurred the growth of a small residential community. Currently, the community is unincorporated, predominantly non-native, and largely permanent, but fairly dispersed. It is typified by people moving in who desire a subsistence lifestyle. However, some residents commute to work in Craig or Klawock, work in the logging industry, as guides, and in other professions. Hollis is connected to the Prince of Wales Island road network, and is the home of the only ferry terminal on the island. It is also served by floatplane, and has an airstrip that can be accessed by a paved road. The character of Hollis and its future economic vitality may be further spurred by these transportation links. Table 3-39 contains some demographic and housing characteristics of the town of Hollis.

Coffman Cove

Coffman Cove is a total population of 182 (USDC, 1992). As shown in Table 3-39, over 80 housing units in Coffman Cove are categorized as mobile home or trailer. As with other logging communities, the town's population is predominantly white (93 percent), with a 2 to 1 ratio of males to females (64 percent male and 36 percent female).

Naukati

The unincorporated community of Naukati depends greatly on the timber industry. The 1990 population was 93 (USDC, 1992). Over 80 percent of its labor force was employed by the KPC. The only other employer in the town is the public school. There is also a limited, but increasing number of households living a subsistence lifestyle as a result of a State land disposal in the area. The ratio of males to females in Naukati is higher than in any of the other communities discussed in this EIS (69 percent to 31 percent), while its population base is almost entirely white (98 percent). These characteristics are similar to other towns that depend on timber harvesting.

Most existing residential structures (83 percent) in Naukati are trailers, reflecting a largely transient population. Most residents have been there 6 years or less. Naukati is expected to continue to grow as a timber and logging camp because of its central location on Prince of Wales Island and its proximity to the existing road system.

Whale Pass

Whale Pass is a dispersed unincorporated community on the northeast coast of Prince of Wales Island. It was originally established as a logging camp about 1962 by the KPC. The logging camp was removed in the early 1980s. Since then, a small, permanent community has developed with a more diversified economic base. Timber harvesting, recreation, commercial fishing, and subsistence all play significant roles in the economy of Whale Pass. The community is accessible by road, float plane, and boat. It has a small store and gas station; a recreational lodge opened in the mid-1980s and several bed and breakfasts and rooming houses also have opened since then.

Most timber workers in the Whale Pass area commute daily from either Naukati or Coffman Cove. The 1990 population of Whale Pass was 75 (USDC, 1992). The ratio of males to females (57 to 43 percent) and the portion of the population under age 18 indicates a stable community with permanent residential characteristics (see Table 3-39).

Summary

A consistent trend in the degree of transitivity of the population and its ethnic makeup emerges from an examination of Table 3-39. The larger the proportion of whites in a community, the more transient the population of the community appears to be. This is substantiated by an examination of the housing markets of the four largest communities (Craig, Klawock, Thorne Bay, and Hydaburg) on the island. Assuming mobile homes and trailers indicate a greater tendency to migrate, the proportion of mobile homes and trailers in each of these communities correlates to the relative size of the community's white population.

Extended Primary ROI

Ketchikan is located on Revillagigedo Island (see Figure 1-1). The Ketchikan vicinity includes Saxman, Mountain Point, Clover Pass, Ward Cove, and Herring Cove, all located on the Ketchikan road system, and Pennock Island. The Ketchikan Area started out as a summer fishing camp for the Tlingit Indians. Development began with a saltery at the mouth of Ketchikan Creek. Ketchikan was a boom town in the late 1800s. Since the early 1900s, timber products have had an important economic influence and a world-scale pulp mill was built in Ward Cove in 1954. Because of its location as a transportation center, fishing center, and focus for the subregion's timber industry, Ketchikan grew rapidly in the 1950s. Mining has increased in economic importance with the pending development of the Quartz Hill mine. Government, tourism, and the general service industry have also grown (TLMP, 1991a).

Ketchikan is the fourth largest and one of the most visited cities in the entire state of Alaska. Cruiseline traffic alone contributes almost $12 million annually to the local economy (Alaska Department of Labor, 1992). In addition to tourism, Ketchikan's economy largely relies on timber and fishing; consequently, the city's economic welfare depends to a large extent on the state of the economy of the lower 48 states and Japan.

The size of Ketchikan's labor force parallels the seasonal fluctuations of the local economy. When a downturn in the local economy creates excess labor, many people leave the area for places with job opportunities. Unemployment rates peak in the winter and fall in the summer when wood products, fishing, and tourism reach maximum output and labor demand. Poor weather, which limits access for industrial operations during the winter months, typically results in high unemployment rates.

Overall, Ketchikan's demographic makeup is similar to that of the State, although it has a higher proportion of renter-occupied housing units than the State. The transient nature of some of Ketchikan's labor force, however, supports the previous claim that a positive correlation exists between the degree of transience in the labor force and the size of its white community.

Southeast Alaska Social Environment

The following discussion focuses on the overall regional characteristics of the social and economic character of Southeast Alaska.

Lifestyles

The lifestyles and economic pursuits of those who move to Southeast Alaska from elsewhere are varied. Many have chosen to live in Southeast Alaska to participate in resource-extraction occupations, primarily timber harvesting; some desire the lifestyle that remote, uncrowded

living situations offer, while others prefer the region because of its hunting and fishing opportunities. Native residents remain attached to Southeast Alaska because of ties to their cultural heritage.

Community Stability

Community stability is a very important consideration in planning any resource management activity in a National Forest; it is also difficult to accurately describe. While income levels, employment rates, regional economic output, and so forth are useful indicators of socioeconomic trends, they do not portray the total picture, particularly the quality of life aspects.

The balance of a variety of natural and human-related resource activities is important to communities in Southeast Alaska. Management of the Tongass National Forest has direct and indirect impacts on the level of regional economic activity as well as the quality of life. Many of the residents of the communities in Southeast Alaska derive their livelihood directly and indirectly from Tongass National Forest. They also are affected by changes in environmental quality, and benefit from the availability of free and abundant resources and products from Tongass National Forest. The preservation of adequate levels of firewood, wildlife, and fish are significant to the sustenance and growth of the local economies as well as the quality of life of the area's residents. In light of their potential impact on community stability, forest management activities are of great public interest.

This page intentionally left blank.

Subsistence

Key Terms

Alaska National Interest Lands Conservation Act (ANILCA)—requires evaluations of subsistence impacts before changing the use of certain Federal lands.
Birds—includes ducks (e.g., mallards, widgeons, teals, shovelers, old squaws, golden eyes, and buffaloheads), seabirds and seaducks (e.g., scoters, murres, murrelets, puffins, seagulls, and cormorants), Canada geese, seabird eggs, and other birds.
Invertebrates or shellfish—includes king crab, dungeness crab, tanner crab, shrimp, sea cucumber, sea urchins, abalone, octopus, scallops, gumboot, clams and cockles, other invertebrates, and herring eggs.
Land mammals—includes deer, moose, mountain goat, black bear, wolf, small game, and furbearers (i.e., marten and land otter).
Marine mammals—harbor seal and other marine mammals.
Nonrural—a community with more than 7,000 people; does not qualify for priority use of subsistence resources. Juneau and Ketchikan are the only two communities in Southeast Alaska which have been determined to be nonrural by the Federal Subsistence Board.
Finfish or fish—includes cod, halibut, flounder, sole, flatfish, rock fish, herring, eulachon, hooligan, Dolly Varden, steelhead, trout, and other fish (excluding salmon).
Plants—includes beach greens, mushrooms, roots, seaweed/kelp, and berries.
Rural—all Southeast Alaska communities other than Juneau and Ketchikan; residents qualify for priority use of subsistence resources.
Salmon—includes king, sockeye (reds), coho, pink (humpback), and chum (dog).
Subsistence—customary and traditional uses by rural Alaskans of wild renewable resources.
Wildlife Analysis Area (WAA)—a division of land designated by ADF&G and used by the Forest Service for wildlife analysis.

Introduction

Congress acknowledged the importance of subsistence activities to the rural communities of Alaska with the passage of the ANILCA in 1980. Section 803 defines "subsistence uses" as:

> . . .the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing or family consumption; and for customary trade.

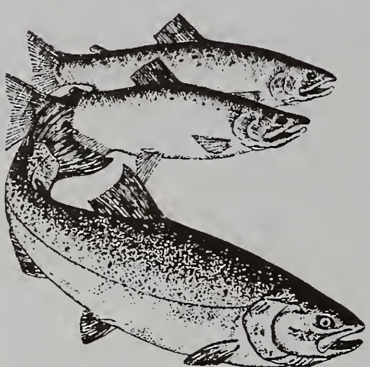
ANILCA does not define "customary and traditional," but the definition has been extensively developed administratively as part of the implementation of ANILCA. Section 804 further stipulates the Federal obligation to provide for subsistence activities as a priority consumptive use.

ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands" (Section 801 (1)). It also legislates that "nonwasteful subsistence uses of fish and wildlife and other renewable resources shall be the priority consumptive uses of all such resources on the public lands of Alaska" (Section 802 (2)).

Effective July 1, 1990, the Federal government took over the management of subsistence use of fish and wildlife resources on Federal public lands. The Federal Subsistence Board regulates this management. Alaska residents of rural areas or rural communities receive priority in the taking of fish and wildlife on public lands for subsistence uses. In Southeast Alaska, the Federal Subsistence Board has declared only Juneau and Ketchikan nonrural.

Subsistence Overview

Subsistence activities are allowed under all management prescriptions under the Forest Plan (TLMP 1997), subject to Federal and State regulations. There is no single management prescription designed to protect or maximize subsistence activities. Rather, subsistence activities have been given a more general priority under Title 8 of ANILCA. The Forest Service's forestwide standards and guidelines for subsistence resources are derived directly from ANILCA Title 8.



Nearly a third of rural households in Southeast Alaska get at least 50 percent of their meat and fish from hunting and fishing (Kruse and Muth, 1990). Categories of subsistence resources used in Southeast Alaska, with the percentage of the total edible regional harvest by weight they comprise, are deer (21 percent), salmon (21 percent), other finfish (24 percent), invertebrates (16 percent), land mammals other than deer (4 percent), marine mammals (3 percent), plants (3 percent), and birds (negligible) (Kruse and Muth, 1990). These percentages are representative of those communities included in this EIS. Subsistence cannot be reduced to or discussed solely in terms of economic factors, however. Even for households that could afford to purchase all their food, harvesting subsistence resources in an important cultural activity, reflecting deeply held attitudes, values, and beliefs. Thus, even though this EIS concentrates on the potential effects of the proposed actions on the harvest of subsistence resources, it does so because currently this is the best indicator of the potential effects of the proposed actions upon the entire subsistence complex. It is also the aspect of the subsistence complex addressed most directly by ANILCA.

The only customary and traditional use determination for terrestrial subsistence resources on Prince of Wales Island (GMU-2) is for deer. Only rural residents of GMU-1A (Meyers Chuck and Metlakatla, but excluding Ketchikan area), and all residents of GMUs-2 and 3 (Prince of Wales Island, Kupreanof Island, Petersburg, Wrangell) are permitted to hunt as subsistence hunters (Subsistence Management Regulations for Federal Public Lands in Alaska, July 1, 1992 to June 30, 1993). Everyone else must hunt deer under general State regulations. For all terrestrial species other than deer, Federal regulations allow all rural Alaskans to subsistence hunt on Federal land. The management of subsistence fishing is currently in flux and is quite complex, but as the effects of the proposed actions will have minimal effect upon fish resources, these effects are not analyzed in as much detail. In summary, for Federal purposes, all Alaskan residents of all of the communities to be discussed in this EIS, except for Ketchikan, are treated the same in terms of classification as "subsistence" hunters.

Tongass Resource Use Cooperative Survey

In 1988, a detailed subsistence resource and use inventory of the Tongass National Forest (Tongass Resource Use Cooperative Survey [TRUCS]) was started as a part of the TLMP revision. The TRUCS of 1988 was directed by the University of Alaska's Institute of Social and Economic Research (ISER), in conjunction with the Forest Service and the Division of Subsistence of the ADF&G (Kruse et al., 1988).

Researchers went to over 30 communities in Southeast Alaska and conducted interviews with randomly selected households about their 1987 subsistence activities and uses. All TRUCS results and conclusions are based on a sample of households; thus, the actual amounts harvested by the study communities could differ from that reported by the sample households. Kruse et al. (1988) contains a detailed description of the survey. GIS maps of subsistence use areas from the TRUCS are presented later in this section.

The Control Lake Project Team used TRUCS data, in conjunction with ADF&G harvest information and other secondary sources, to determine which communities potentially would be affected by the proposed actions and thus should be included in this analysis. Galginaitis (1994) discusses this process in some detail, which resulted in the selection of 11 study communities for this project: Coffman Cove, Craig, Hollis, Hydaburg, Ketchikan, Klawock, Metlakatla, Naukati, Saxman, Thorne Bay, and Whale Pass.

Control Lake Subsistence Interviews

Overview of Interview Results

The Project Team conducted a limited number of personal interviews in each of the study communities to supplement existing information (TRUCS, harvest statistics, other secondary sources). These concentrated on filling in data gaps and verifying whether the somewhat dated TRUCS data was still applicable. The objective of this field work was not to obtain information from a statistically representative sample from each community, which was beyond the scope of this project. Rather, it was to elicit information from some of the most active subsistence harvesters in each community to establish the type and range of subsistence activities involved in that community's pattern of use. This information was then used to reinforce or modify the description of community use developed from previous information. While this information cannot be used to make statistical comparisons with TRUCS results, it provides a rich and reliable qualitative supplement.

The team conducted a total of 107 individual interviews; the vast majority concerned primarily the use of subsistence resources. In addition, the Project Team held a number of collective discussions about community subsistence use of the Project Area and potential effects upon this use in Klawock, where there is considerable local interest. The methodology of this work is only summarized here. More detail can be found in Galginaitis (1994).

The field effort concentrated in those communities presumed to be potentially more affected by the proposed action and/or those communities that were poorly documented in existing records. Community population size also was considered. Six communities accounted for the bulk of the field effort: Ketchikan (19 interviews), Klawock (17), Hydaburg (14), Craig (12), Thorne Bay (11), and Naukati (9).

A protocol outlining the information sought and the topics to discuss guided the interviews. Interviewers asked residents about their personal and household use of land and sea mammals, finfish, shellfish, birds, plants, and other subsistence resources. Areas of use and access to those areas were specifically elicited, as were opinions about the potential effects of the proposed actions on that use. The interviewers invited respondents to discuss recreational use of subsistence resources as activities supplementary to, competitive with, or both, to subsistence activities. The field study also collected demographic, employment, and other descriptive information. The discussion below summarizes the results of these interviews. More detail can be found in Galginaitis (1994).

Affected Communities

The following discussion provides a brief description of subsistence resource use patterns for each of the study communities based on the interviews. Summary community harvest tables are included in Galginaitis (1994). The areas used for subsistence deer hunting by less than 1, 1 to 5, 5 to 15, and greater than 15 percent of the households in each affected community are presented in Figures 3-27 through 3-32. A WAA map is provided in Figure 3-23 in the Wildlife section. Table 3-40 summarizes the characteristics of the Prince of Wales Island communities included in the Control Lake Subsistence Analysis.

Table 3-40
Prince of Wales Island Study Communities

Place	Pop. (TRUCS 1990)	Native/Non-Native (%)	TRUCS Sample (X of Y HHs)	Vacancy Rate	Subsistence Harvest (lb/per capita, total harvest)	Subsistence Dependence (meat) (%)
N. Whale Pass	50	5/95	18 of 18	51	186 9000	43
Hollis	82	18/82	29 of 32 91%	52	164 13,000	42
Hydaburg	384	11/89	35 of 110 32%	15	337 128,000	37
Coffman Cove	224	0/100	41 of 66 62%	14	186 35,000	25
Saxman	266	80/20	36 of 76 47%	28	90 23,000	21
Thorne Bay	477	3/97	52 of 156 33%	31	188 90,000	37
Klawock	795	45/55	52 of 224 23%	15	239 186,000	36
Craig	1,182	28/72	64 of 365 18%	6	189 219,000	25
Naukati	93	1/99				
Ketchikan	12,705	15/85T				

SOURCE: USDA Forest Service, 1991a; Kruse and Muth, 1990; Kruse and Frazier, 1988; and USDC, 1992.

A wide variety of subsistence activities takes place within the Control Lake Project Area. Table 3-41 shows the per capita pounds of edible subsistence harvest by type for communities using the Project Area. This is based on the total community harvest from all areas used, not just from the Project Area. This table shows that marine resources are important consumption resources. The State rather than the Federal government has managerial responsibility for most of those resources at present. Freshwater fish make up only a small part of this overall harvest, although a navigable waters dispute could conceivably affect small salmon streams in the future. For this EIS, however, the extent to which the proposed actions may affect these species is treated in *Wildlife* (Section 3.7) and Confer (1994). Little time was devoted to documenting local use of these resources.

Table 3-41

Per Capita Subsistence Harvest (Edible Pounds for Rural Communities, 1987)

Community	Deer	Other Mammal	Salmon	Finfish/Marine Invert.	Other	Total
Coffman Cove	59.6	0	51.8	67.5	6.8	185.7
Craig	40.6	3.2	40.4	88.6	12.1	185.0
Hollis	37.9	8.7	44.4	63.0	9.9	163.9
Hydaburg	42.8	0.6	137.4	135.8	20.4	337.1
Juneau	NA	NA	NA	NA	NA	NA
Ketchikan	NA	NA	NA	NA	NA	NA
Klawock	34.5	1.2	69.4	85.8	32.6	223.3
Metlakatla	10.6	0.2	20.3	32.5	7.2	70.8
Naukati Camp	NA	NA	NA	NA	NA	NA
Petersburg	43.9	18.9	45.3	79.4	12.8	200.3
Saxman	16.6	5.4	33.2	27.9	6.3	89.3
Thorne Bay	36.7	5.9	47.9	92.8	4.5	187.7
Whale Pass	50.2	16.5	41.1	71.8	6.6	186.1
Wrangell	20.4	16.9	30.2	84.2	12.4	164.2

Source: ADF&G Community Profile Database Catalog, Volume 1: Southeast Region.

Deer is the only terrestrial species with an important consumptive use in the local diet. Still, a wide variety of plant and animal resources, especially for the western part of the Project Area, are important for people from Klawock and Craig. Residents of other communities did not mention as many other resources, although black bear and furbearers are animals that are harvested (Galginaitis, 1994).

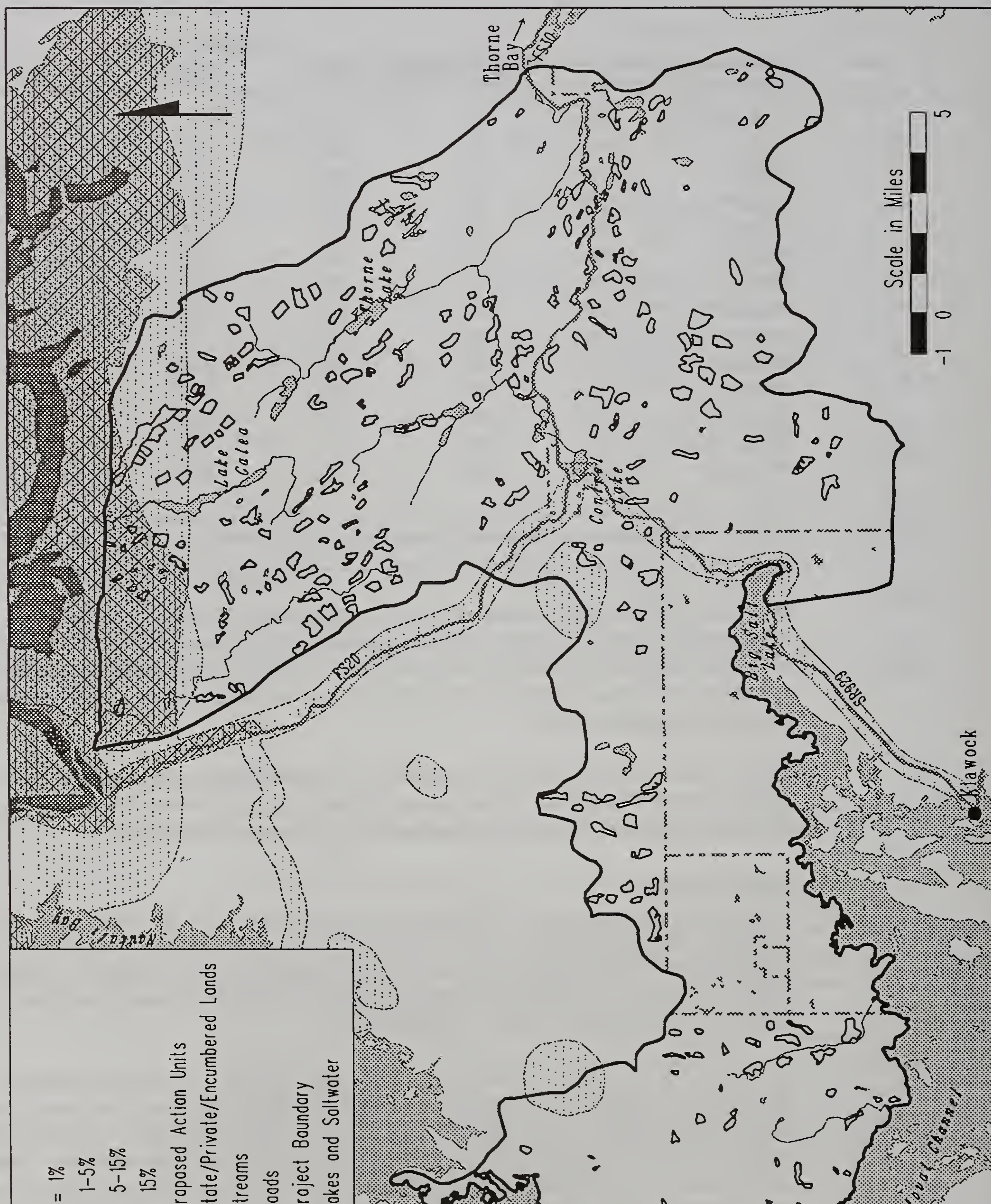
Based on their perceived level of importance and the potential for project effects, fish and wildlife (especially deer) are the subsistence resources of most concern in this Supplemental Draft EIS. However, other resources are considered in separate subsections.

Coffman Cove

Local hunters report that most Coffman Cove residents hunt in the immediate vicinity of the community and rely heavily on road access. They also say that many nonlocal hunters use Coffman Cove's local hunting area. The ADF&G hunter survey data support these statements. Coffman Cove residents took 60 to 88 percent of their deer from the two WAA's closest to the community—WAA's 1420 and 1421.

The portions of WAA 1421 in the Project Area are the only part of the area potentially harvested by Coffman Cove hunters to any significant extent. Coffman Cove hunters have taken about 37 percent of their documented deer harvest from WAA 1421. The TRUCS map (Figure 3-27) for areas ever hunted for deer by Coffman Cove residents within the Control Lake Project Area underscores the general description of Coffman Cove use patterns (close to the community, road-oriented), and indicates that relatively little use occurred in those parts within the Project Area.

Figure 3-27
Coffman Cove TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)



/glacier3/controllk/amls/post8x11/trucs.aml
3/8/94
cc-ehd

Craig
While there was aboriginal use of the Craig area for fish camps and settlement sites in the area (most notably at Klawock), the present permanent community of Craig dates from the salmon packing operation started in 1907 on Fish Egg Island, just northwest of the present location of Craig. While Natives comprise a significant portion of the population, Craig as a community has a relatively short time depth and a predominantly non-Native organization. This is in sharp contrast with the community of Klawock; however, some residents of Craig are quite similar to those of Klawock in their patterns of subsistence resource use.

Hunters from Craig use all four WAA's comprising the Control Lake Project Area. Since Craig is located within WAA 1318, this WAA is clearly the most significant in terms of its community harvest (about 31 percent). The other Project Area WAA's each provide 5 to 8 percent of the community's overall deer harvest. Craig takes more than 10 percent of the total deer harvested from each of the Project Area WAA's, with WAA 1323 (29 percent) and WAA 1318 (50 percent) being the most significant.

Craig hunters report using both boats and road vehicles for access to deer hunting areas. Figure 3-28 shows that Craig hunters use all portions of the Project Area accessible either by boat (and hiking) or by road (and hiking). There is some indication that boat-based hunters are willing to hike farther than road-based hunters. Respondents do not report using the relatively unroaded portions of WAA 1319, otherwise accessible by road, whereas they do report using all of WAA 1323, which is almost totally unroaded but accessible by boat. Overall, Craig hunters report using road corridors most heavily.

Hollis
Hollis deer hunters prefer to hunt their local area. Hollis residents hunt in the Control Lake Project Area, but only at a relatively low level. The TRUCS map (Figure 3-29) indicates that those portions of WAA's 1318 and 1421 used by Hollis hunters are, for the most, part outside of the Project Area.

Hydaburg
The documented deer harvest for Hydaburg shows that the Project Area contributes about 18 percent of the community's total deer harvest. This harvest is fairly evenly spread over all four Project Area WAA's. The TRUCS map for Hydaburg (Figure 3-30) shows that all of Prince of Wales Island, and much of other parts of Southeast Alaska, are equally important for deer hunting. Project field interviews support the conclusion that Hydaburg hunters use the Project Area only in a very limited way, and generally stay south of the Project Area.

To some degree, all Hydaburg households rely on subsistence resources for daily food. Hydaburg residents share substantial amounts of subsistence foods with friends and relatives in other communities. A portion of these resources are probably taken from the Project Area. However, little good information exists on the amount of such sharing and the area of origin of the resources shared.

Ketchikan
The off-island community with the largest reported harvest in the Project Area is Ketchikan located on nearby Revillagigedo Island. Ketchikan also differs from the other communities reviewed in this analysis based on its status under Federal subsistence law as an "urban" (non-subsistence) community. Since Ketchikan residents are not subsistence hunters by definition, harvest composition information comparable to that for rural communities is not available.

Figure 3-28

Craig TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)

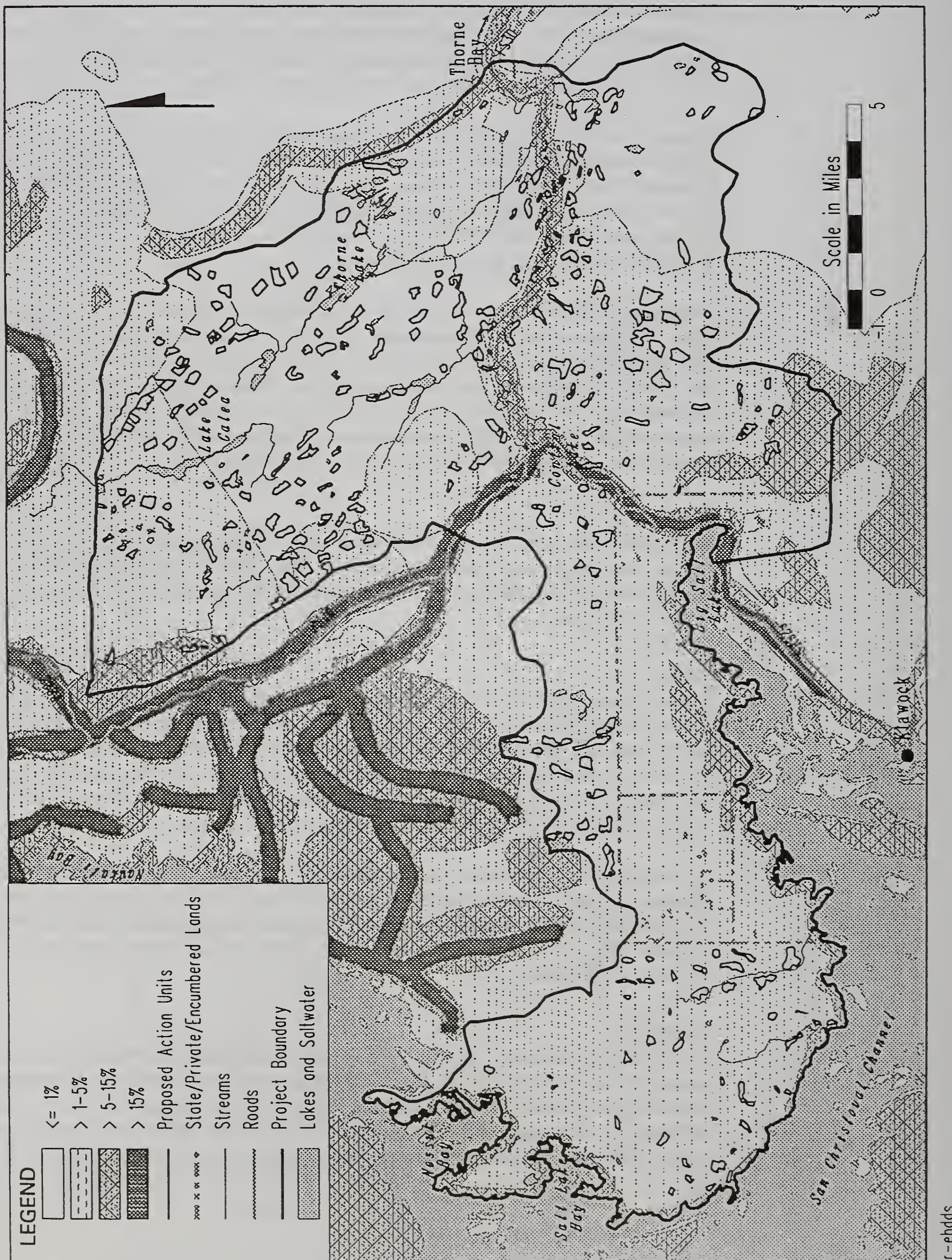


Figure 3-29
Hollis TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)

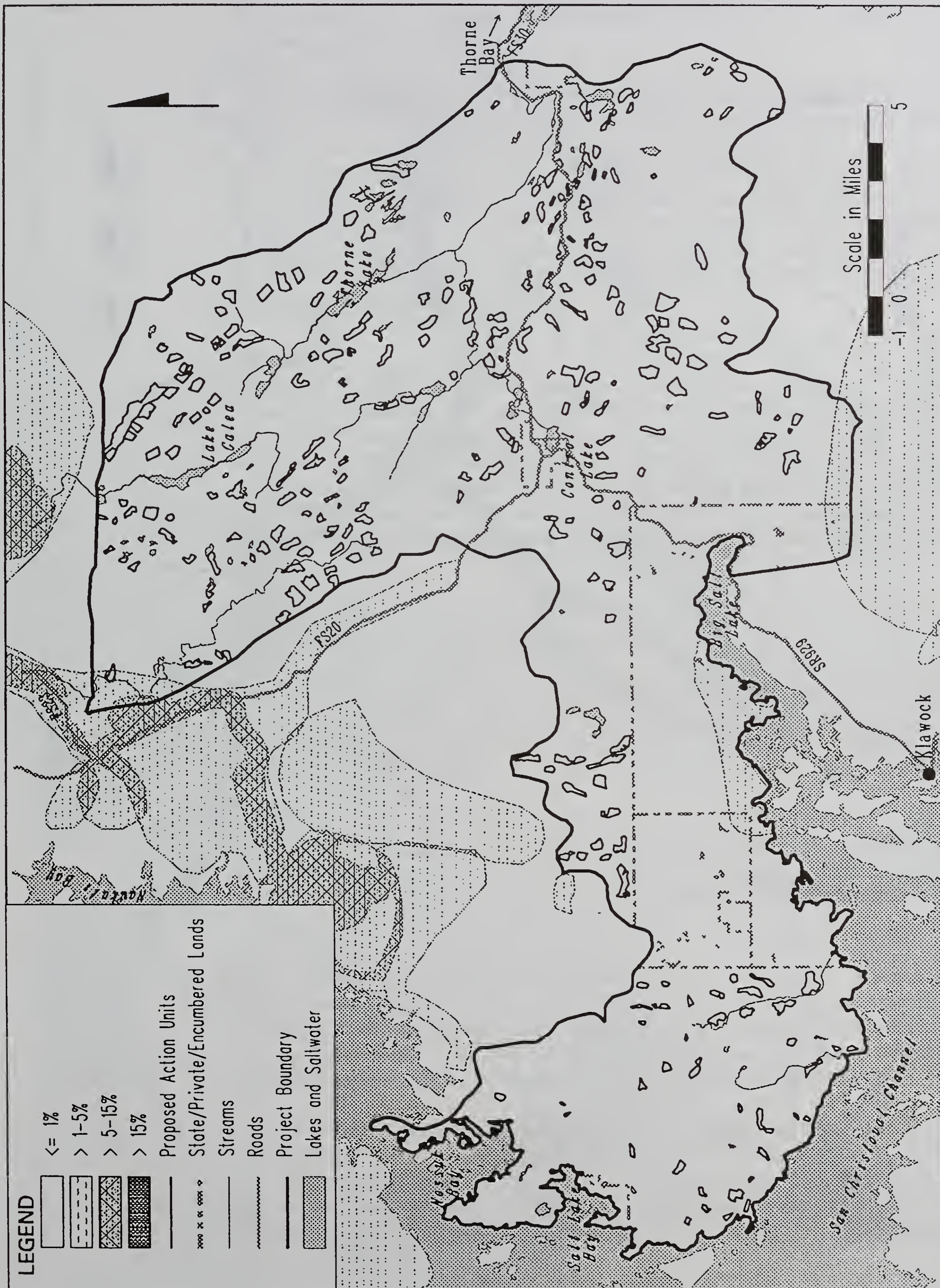
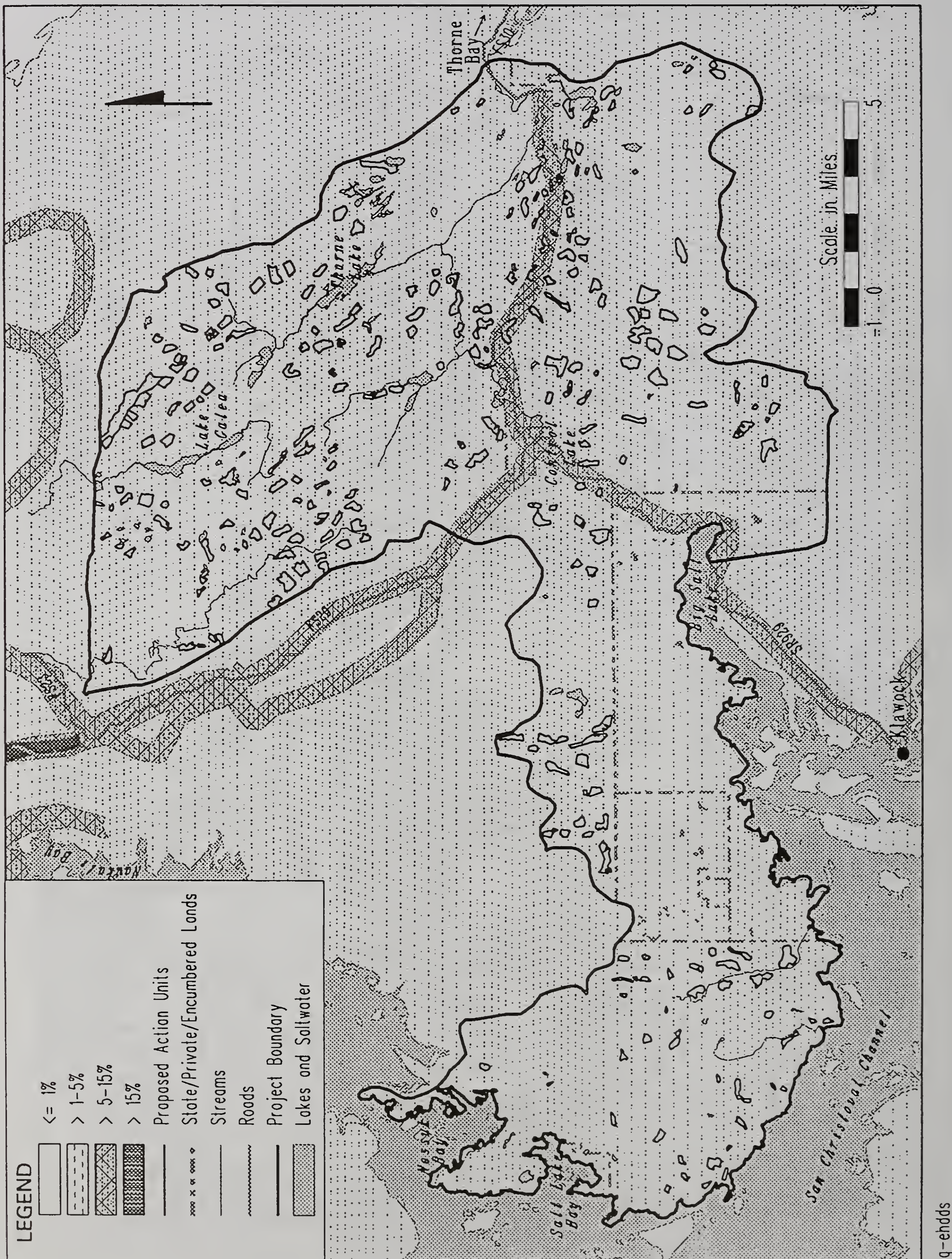


Figure 3-30
Hydaburg TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)



Ketchikan reportedly takes well over half (57 percent) of its total community deer harvest from GMU 2, and 14 percent of its total community deer harvest comes specifically from the Control Lake Project Area. Ketchikan takes an average of 21 percent of all deer reported harvested from the Project Area (and Ketchikan hunters account for 30 percent of all deer taken from GMU 2 as a whole). Ketchikan hunters take from 7 to 45 percent of the total deer harvested in the four WAA's.

Clearly, Ketchikan hunters compete with subsistence hunters within the Project Area WAA's. Ketchikan hunters harvesting deer on Prince of Wales Island, and especially within the Project Area, are overwhelmingly road-oriented hunters entering the Project Area via the road network's ferry access at Hollis. But, Ketchikan hunters are not exclusively dependent upon direct road access to hunt deer; they take 24 percent of the total deer harvested in WAA 1323, which has little road access (primarily from the north, which is a well-roaded area heavily used by Ketchikan hunters). Any further roading of this area would potentially increase its use by Ketchikan hunters, thus increasing competition for the "boat" hunters from other communities who use this area.

Klawock

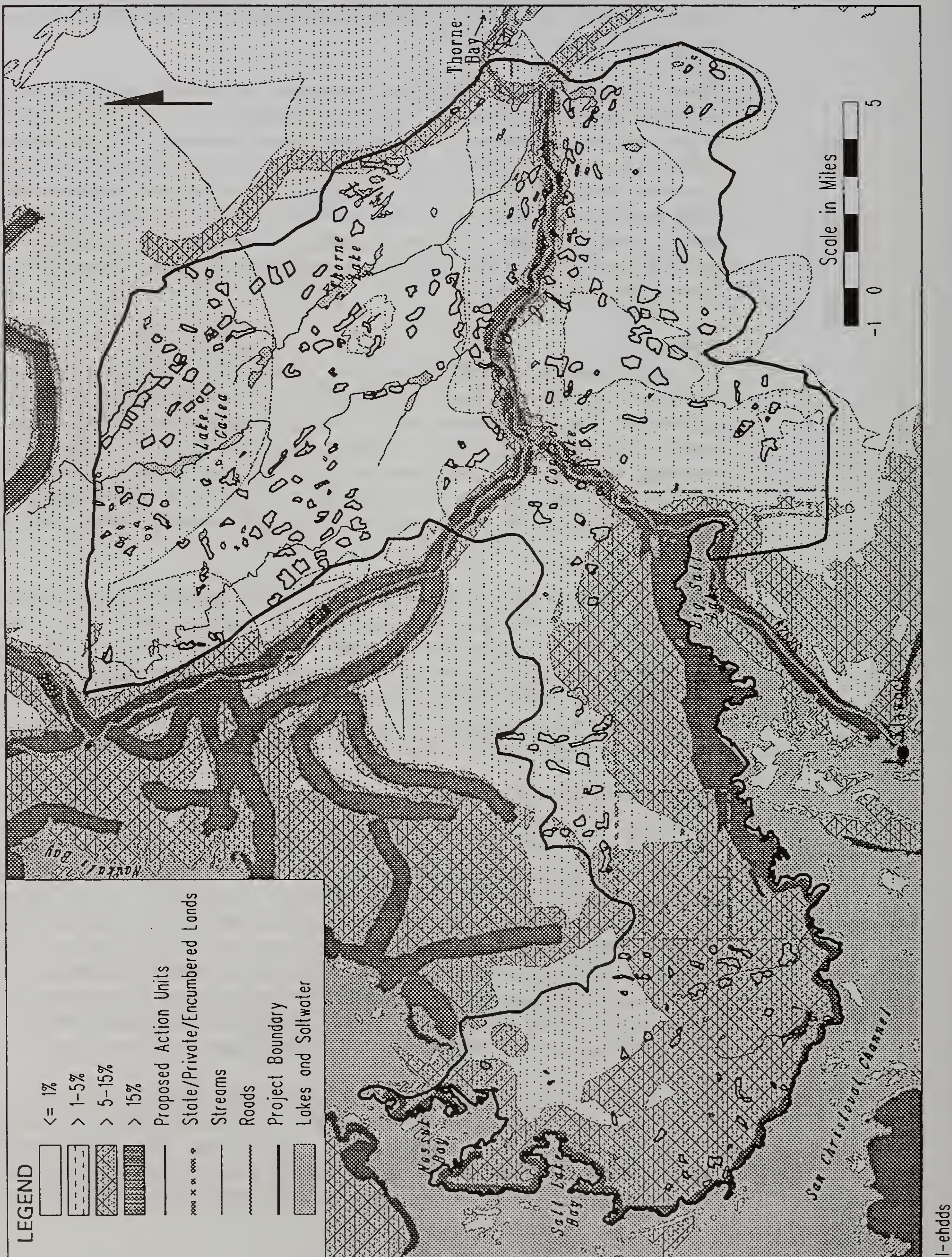
Because of its identity as a Native community, Klawock has an historical relationship with the subsistence resources of the area. Ellanna and Sherrod (1987) provide an historical discussion of Klawock territorial subsistence patterns, although the details are not always clear. They argue that the earlier (and more predominantly Tlingit) population of Klawock was more seasonally mobile and exploited a larger territory than has the Klawock population of 1970 to the present. In other words, the current population of Klawock is more dependent upon their local area, which includes the Control Lake Project Area, than were residents of Klawock in the past.

Ellanna and Sherrod also note that as recently as 1982, 67 percent of Klawock hunters harvested deer exclusively from boats, whereas in 1984 this figure fell to only 9 percent. Hunters exclusively using cars or trucks went from 5 percent in 1982 to 62 percent in 1984. Thus, by 1984, the Klawock deer harvest pattern had switched from coastal-skiff to interior-road (Ellanna and Sherrod, 1987) as a result of the access provided by logging roads and the competition for resources closer to the village. Close to 70 percent of Klawock residents used roads as their primary means of access to deer by 1984, basically in a northern direction.

The ADF&G hunter survey information for 1988 to 1991 and the TRUCS map (Figure 3-31) demonstrate this pattern. Klawock residents use the Project Area on a regular basis; they use WAA 1318 very heavily and all but WAA 1421 relatively heavily. Klawock hunters harvest more deer from areas close the community than from those farther away. The WAA's immediately around Klawock (WAA 1318 and WAA 1323) appear to be predominately coastal hunting areas, where skiffs are used for access. Interviews in Klawock with local hunters indicate that they perceive these areas as important because of their boat access. While portions of this area are accessible by road, and are hunted in that manner, the character of the area is based on hunting from boats. Over 50 percent of the community's deer harvest can come from these two WAA's, but the importance local hunters attribute to this area, and especially WAA 1323, goes far beyond the actual resources harvested.

Klawock hunters repeatedly stressed that WAA 1323, which they referred to as the Elevenmile area, was where they had been taught to hunt by their fathers and grandfathers, and was where they wanted to teach their own children to hunt. They did not want the character of the area to change. The greatest value to them is being able to experience the hunt, and the land, in the same way as their ancestors. They believe any timber harvest

Figure 3-31
Klawock TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)



activity or road construction in WAA 1323 will harm their present use of this area. Furthermore, they frequently mentioned this western part of the Project Area as important for other subsistence resources—seaweed, seals, various sorts of invertebrate seafood, and fish. No other part of the Project Area was characterized as such a multiuse area.

Naukati

The subsistence resource use patterns for Naukati have not been well documented, since it was not included in the TRUCS. Most of the following description is based on limited Project field work in the community, supplemented by a discussion of the available ADF&G harvest statistics.

As with other communities in the Project Area, fishing is very important to the residents of Naukati. While interviewees did not quantify the amount of fish caught per household, or compare it to the amount of deer harvested, fish are probably at least as important as deer in terms of edible harvest. Most deer hunting out of Naukati is done in the immediate vicinity of the community or to the south toward Winter Harbor. Most Naukati hunters reportedly do not go more than a mile or so north of the community. A few do report hunting the Control Lake Project Area at times. Although hunting near the roads is productive, and almost all Naukati hunters use the roads to access good hunting areas, a fair number of local hunters are "bush beaters," that is, they prefer to hunt off the roads. Many people also hunt the valleys and spur roads.

ADF&G harvest statistics support the pattern described by local informants. The Project Area is little used, with almost all Naukati deer taken from the WAA's immediately surrounding the community. There is limited road access to WAA 1323 from the north (the Naukati area), but Naukati residents also mention using boats to hunt the coast.

Thorne Bay

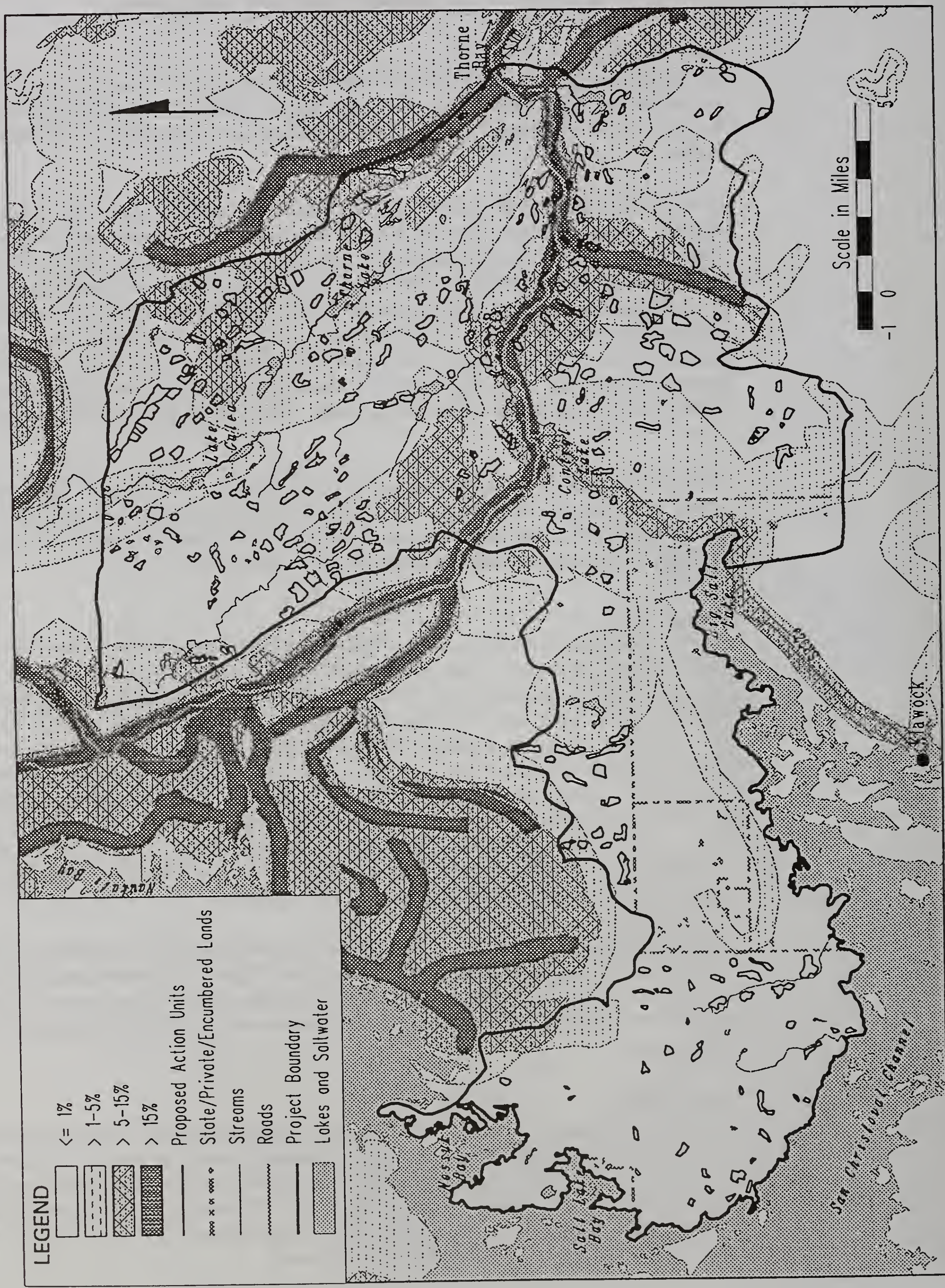
Mapped subsistence use information for Thorne Bay has not been updated since 1987. ADF&G harvest statistics and the limited project field work confirm the TRUCS description that Thorne Bay hunters use mostly those areas closest to the community, and use both boats and road vehicles for access. For areas farther from the community, road access is by far the most important. They also use alpine areas and other areas considerable distances from roads; but, most hunters prefer to minimize packing effort and time by confining themselves to near-road hunting. This hunting effort is almost totally local, and is clearly related to Thorne Bay's historic location at the end of one branch of the road network. Most of Thorne Bay's deer are taken in the two WAA's of the Thorne Bay road network (1315, 1319), the WAA to the north which contains the main 20 Road and the Naukati road network (1422), and the two WAA's of the Coffman Cove road network (1420, 1421).

While all four Control Lake Project Area WAA's are used by Thorne Bay hunters, only WAA 1319 is used to a significant extent. The TRUCS map (Figure 3-32) shows that this use is concentrated along road corridors. The TRUCS map also shows that the heaviest documented use of WAA 1319 by Thorne Bay hunters is of that portion of the WAA not included in the Project Area.

Whale Pass

Whale Pass deer hunters reportedly use three of the four Control Lake Project Area WAA's from which they take about 20 percent of the community's total deer harvest. They report no use of WAA 1323. The TRUCS map and project interviews indicate that hunting use of the Project Area is almost exclusively road-oriented. Few Whale Pass residents reported using the Project Area as a primary hunting area in other than an opportunistic way, taking deer as available on their trips to and from Craig and Klawock.

Figure 3-32
Thorne Bay TRUCS Map (Areas Ever Hunted for Deer—Percent of Households)



Other Potential Study Communities

Of all communities with documented deer harvest of any level within Control Lake Project Area WAA's, about half were eliminated from consideration as study communities because their documented harvest was very small and, in most cases, quite variable (Galginaitis, 1994). Four of the communities—Hyder, Kasaan, Metlakatla, and Saxman—while not treated as study communities, are discussed briefly here because of the uncertain quality of the available information. For all four of these communities, the community's use of the Project Area is peripheral to its general pattern of subsistence resource use.

Hyder takes a significant percentage of its total deer harvest from the Project Area. However, this number is very small both in terms of the total deer harvest taken from the Project Area and the total Hyder community harvest of all subsistence resources.

The available information on Kasaan deer harvest is consistent with a pattern of preferred local use and access by boat. Kasaan until recently has not been connected to the Prince of Wales Island road network. ADF&G documents harvest only from WAA 1315, the immediate Kasaan area, with some community effort reported in other limited areas. More distant areas (Prince of Wales Island, Admiralty Island), accessed by boat, were less frequently used. Whereas in the past the Kasaan hunting use area included parts of the Control Lake Project Area, such as Black Bear Lake, this is currently perceived as a peripheral use area. Kasaan residents generally has not used the road network for deer hunting.

ADF&G information suggests that Metlakatla hunters concentrate in areas close to their community. ADF&G-updated TRUCS information (Betts et al., 1993) also confirms this pattern of mostly local use. Two informed local sources, the Mayor of Metlakatla and the Director of Natural Resources for the Metlakatla Village Corporation, indicated that few Metlakatla residents used the Control Lake Project Area for subsistence activities.

As with many Native communities, available ADF&G hunter survey information on Saxman is generally thought to be relatively unreliable. Only 29 deer are reported to have been harvested by Saxman residents for the 4-year period 1988 to 1991, with seven (24 percent) coming from the Control Lake Project Area (varying from 0 to 39 percent). Saxman residents report taking no deer in any areas in 1988 or 1989. ADF&G acknowledges that its information for Saxman is somewhat weak and cautions that because of low response rates "study results for Saxman and Hydaburg should be used with caution" (Kruse et al., 1988). Consequently, the field work for the Control Lake Project involved interviews in Saxman, Ketchikan, and Hydaburg with Saxman residents. The results of the field investigations confirmed the literature description of Saxman's hunting use area. Few Saxman hunters travel to Prince of Wales Island specifically to hunt deer, but those who do visit in hunting season will sometimes hunt. This is a very different pattern from that of nearby Ketchikan hunters who very actively use Prince of Wales Island for deer hunting.

Affected Resources

The Project Area supports a wide variety of subsistence activities including harvesting fish, deer, bear, waterfowl, furbearers, clams, crabs, shrimp, and gathering berries and seaweed. In addition, many residents use trees for firewood and lumber. Of these resources, the Control Lake Project could most affect deer, bear, furbearers, and fish. The current use of these resources is discussed below.

Deer

The Sitka black-tailed deer is an important subsistence species found throughout the Project Area. Deer populations on Prince of Wales Island are now moderately high following a decline in the 1970s. The general hunting season is August through late December. Harvest

is generally concentrated during two periods: the first few weeks of the season in August and later in November when the rut occurs. Although most of the early deer harvest occurs from or near a timber harvest access road (Mankowske, 1985), a significant harvest effort is directed toward traditional alpine areas where deer, especially bucks, are concentrated during August.

In 1987, deer constituted an average of 13 to 32 percent of the total subsistence harvest for each household: Coffman Cove, 32 percent; Craig, 22 percent; Hollis, 23 percent; Hydaburg, 13 percent; Klawock, 15 percent; Thorne Bay, 20 percent; and Whale Pass, 27 percent (Kruse and Muth, 1990). Table 3-42 provides the total deer harvest by community and WAA from 1988 through 1991. Craig residents harvested the greatest number of deer, followed by Ketchikan residents, Klawock residents, and Thorne Bay residents.

Table 3-42
Total Summary Deer Harvest for Communities with Any Reported Harvest in Project Area WAA's, 1988-1991

	WAA Harvest					Community Project Area WAA Harvest			
Community	1318	1319	1323[1/]	1421	Total	Other WAA's	% PA	% Com.	Total Harvest
Coffman Cove	**0**	**2**	**157**	**159**	**318**	**267**	3.98	37.3	426
Craig	715	181	147	106	1,149	**1,129**	28.79	50.44	2,278
<u>Hollis</u>	6	0		6	12	71	0.30	14.46	83
<u>Hydaburg</u>	4	8	7	9	28	128	0.70	17.95	156
Hyder				2	2	9	0.05	18.18	11
Juneau	0	0	0	30	30	14,813	0.75	0.20	14,843
Ketchikan	**105**	**217**	**122**	**380**	**824**	**5,287**	20.65	13.48	6,111
Klawock	475	100	137	44	756	**394**	18.94	65.74	1,150
Long Island Camp	3	5		8	131	0.20	5.76	139	
Metlakatla	2	2		0	4	144	0.10	2.70	148
<u>Naukati</u>			10	0	10	105	0.25	8.70	115
Other Alaska[2/]	12	21	2	7	42	16,602	1.05	0.25	16,644
Outside Alaska	37	13	3	15	68	208	1.70	24.64	276
Petersburg	**15**	**19**	**54**	**24**	**112**	**4,346**	2.81	2.51	4,458
Point Baker					3	73	0.08	3.95	76
<u>Saxman</u>	0	7			7	22	0.18	24.14	29
Thorne Bay	**43**	**588**	**18**	**49**	**698**	**696**	17.49	50.07	1,394
Whale Pass	**10**	**18**		**8**	**36**	**146**	0.90	19.78	182
Wrangell	5	27	5	6	43	1,293	1.08	3.22	1,336
Subsistence	1,290	978	383	418	3,069		76.90		
Non-subsistence	142	230	125	425	922		23.10		
Total	1,432	1,208	508	843	3,991				

Source: Thornton, 1992.

1/ WAA 1323 was numbered as WAA 1321 in 1988.

2/ Communities with low and sporadic documented harvest from the Project Area—includes Edna Bay, Haines, Meyers Chuck, Natzuhini Camp, and Sitka.

BOLD indicates most significant harvests (as part of community's total harvest, total harvest from WAA or Project Area, or both).

<u>UNDERLINED</u> indicates harvests potentially significant for other than numerical values as such. The Control Lake Project Area contains only portions of WAA's 1318, 1319, and 1421. It contains most or all of WAA 1323.

PA Project Area

Table 3-43 lists current deer harvest by Project Area WAA. There is concern that with increasing harvest levels in these WAA's and decreasing deer habitat capabilities (see *Wildlife* section) deer numbers may eventually fall short of numbers needed to support harvest. Because subsistence use has priority over non-subsistence use, at some time in the future it may be necessary for the Federal Subsistence Board to restrict the number of deer harvested by non-rural hunters to leave adequate numbers of deer for subsistence users.

Table 3-43
Current Harvest of Sitka Black-Tailed Deer By WAA

WAA	Average Annual Total WAA Harvest 1988-91[1/]	Average Annual Subsistence WAA Harvest 1988-91[2/]	Predicted Total WAA Harvest 1995[3/]
1318	358	323	391
1319	302	245	330
1323	127	96	139
1421	211	105	231
Total	998	769	1,091

Source: Thornton, 1992. Data derived from ADF&G total WAA deer harvest data.
1/ Values in table indicate number of deer.
2/ Includes entire WAA, including portions outside the Project Area.
3/ Assuming harvest levels increase 1.8% per year.

The problem exists primarily within the heavily roaded WAA's 1318 and 1319. These two WAA's include or are immediately adjacent to three of the largest communities on Prince of Wales Island: Craig, Klawock, and Thorne Bay.

Among local communities, Craig, Klawock, and Thorne Bay have taken 50 percent or more of their deer harvest from Project Area WAA's (Table 3-42). Project Area WAA's provided 10 to 50 percent of the community deer harvest for Coffman Cove, Hollis, Hydaburg, Hyder, Ketchikan, Saxman, and Whale Pass. The communities of Juneau, Long Island Camp, Metlakatla, Naukati, Petersburg, Point Baker, Wrangell, and others derived less than 10 percent of their annual harvest from Project Area WAA's.

Black Bear

Table 3-44 displays the current black bear harvest by Project Area WAA. An average of 44 black bears were reported to be harvested annually in the Project Area from 1988-1989 through 1990-91. There is concern that habitat capability may not be sufficient to satisfy harvest levels over the long-term for WAA 1318. Harvest levels, and particularly subsistence harvest levels, appear to be low enough in the other WAA's of the Project Area, to avoid conflicts with available habitat. These factors balance out to some degree on an area-wide (Project Area) basis, but could create some localized resource problems. The apparent overharvest of black bear in WAA 1318 indicates that demand may outstrip supply in readily accessible areas, and that similar problems could easily develop in the rest of the Project Area WAA's. This could result in the need to restrict non-subsistence harvest of black bear in the Project Area in the future.

Table 3-44
Current Harvest of Black Bears by WAA

WAA	Average Annual Total WAA Harvest 1987-91[1/]	Average Annual Subsistence WAA Harvest 1987-91[2/]	Predicted Total WAA Harvest 1995[3/]
1318	32	11	35
1319	9	6	10
1323	1	0	1
1421	2	1	3
Total	44	18	49

Source: Paul, 1992. Data derived from ADF&G total WAA bear harvest data.

1/ Values in table indicate number of bears.

2/ Includes entire WAA, including portions outside the Project Area.

3/ Assuming harvest levels increase 1.8% per year.

Most of the reported black bear harvest is from WAA 1318, but it is unknown how much of this comes from the Project Area itself. Subsistence bear harvest, especially in WAA 1323, may be under represented in ADF&G harvest statistics. WAA 1323 is reported as a prime use area for deer, fish, and plant subsistence resources, but has no reported take of bear by subsistence hunters, which seems unlikely. However, interviews conducted in Craig and Klawock (the subsistence communities closest to this area) indicated that few local hunters actually took black bear.

The future demand for black bear is uncertain. The subsistence harvest of black bear from the Project Area has been far less variable than the non-subsistence harvest. Black bear are not hunted by the population as a whole to the same degree as deer. All interviewees reported that the majority of black bear taken in the Project Area are harvested by non-subsistence hunters and that the subsistence take was relatively minor.

Marten and River Otter

Furbearer harvest supplements the seasonal income of many area residents, most of whom are subsistence users. The intensity of trapping differs from the occasional trapper who targets primarily marten and beaver close to the road system to those individuals pursuing all furbearers both near to and far from the road system. Harvest effort usually is concentrated along the saltwater-upland interface, and near or along major river systems. Marten appear to be the most old-growth-associated of the furbearers, and are trapped intensively in old-growth areas adjacent to the road system.

Tables 3-45 and 3-46 display the marten and river otter harvest and habitat capability by WAA. An estimated 146 marten were harvested annually in Project Area WAA's from 1988 to 1992. Marten habitat capability may be lower than that needed to support harvest in WAA's 1318 and 1319. Restriction of non-subsistence harvests could be necessary in the near future.

Table 3-45
Current Harvest of Marten by WAA

WAA	Average Annual Total WAA Harvest 1988-91[2/]	Predicted Total WAA Harvest 1995[3/]
1318	66	72
1319	59	65
1323	0	0
1421	21	23
Total	146	160

Source: Paul, 1992. Data derived from ADF&G total WAA marten harvest data.

1/ Values in table indicate number of martens.
2/ Includes entire WAA, including portions outside the Project Area.
3/ Assuming harvest levels increase 1.8% per year.

Table 3-46
Current Harvest of River Otters by WAA

WAA	Average Annual Total WAA Harvest 1988-91[2/]	Predicted Total WAA Harvest 1995[3/]
1318	7	8
1319	5	5
1323	0	0
1421	4	4
Total	16	17

Source: Paul, 1992. Data derived from ADF&G total WAA river otter harvest data.

1/ Values in table indicate number of river otters.
2/ Includes entire WAA, including portions outside the Project Area.
3/ Assuming harvest levels increase 1.8% per year.

An estimated 16 river otter were harvested annually in Project Area WAA's from 1987 to 1991. Populations needed to support current river otter harvests are believed to be close to or below the habitat capability in the Project Area. Interviewees did not report any significant trapping or other use of river otter. More trapping was done historically than occurs today. Trapping activity levels generally reflect the price of fur and because fur prices are currently low (and have been for some time), few people are trapping. ADF&G harvest data do not show the residence of those who harvest river otters.

Wolf

Table 3-47 contains summary harvest data for the wolf. Local interviewees reported that the local wolf population was healthy. However, the harvest rate appears to be high relative to available habitat (see *Wildlife* section). Restrictions on non-subsistence users may be necessary in the near future.

Table 3-47
Summary of Documented Project Area Wolf Harvest

Year	Total	1318	1319	1323	1421
1987-1988	18	9	3	0	6
1988-1989	8	4	4	0	0
1989-1990	15	5	4	0	6
1990-1991	6	0	0	1	5
Average	11.8	4.5	2.8	0.2	4.2

Source: Harvest data provided by ADF&G.

Fish

Salmon and trout are the principal subsistence fish resources in the Project Area. Sockeye is by far the most important species. Chum and pink salmon are also caught in the Klawock River, but at only about 5 percent of the sockeye numbers. Other species are harvested in the other locations as well, but at very low reported levels. Information on harvest by community is not very reliable because of the various modes of harvest. The ADF&G maintains statistics on personal use/subsistence permits for salmon (Table 3-48) but not all subsistence users apply for such permits. Many catch and retain fish under sports regulations or as part of a commercial operation. Others may fish without a permit. Not all people who fish with personal use/ subsistence permits report their harvest or where they fished. Thus, using such permit information as a full measure of subsistence fishing clearly understates the real use of this resource. TRUCS information, although dated, probably is still the best available data on community reliance upon fish resources.

Table 3-48
Project Area-Related Streams, Permit and Harvest Statistics (1985 to 1993)

	Annual Average	Average Annual Harvest (Number of Fish)			
Stream	Number of Permits	Sockeye	Coho	Pink	Chum
Klawock River	143	2,779	140	157	115
Karta River	128	1,593	5	14	1
Thorne River	4	51	0	17	0
Shinaku Creek	less than 1	0	0	0	30

Source: Personal Communication, Gary Timothy, ADF&G, Commercial Fisheries, Juneau, 1994.

ADF&G permit information for the Control Lake Project Area (Table 3-49) also is perhaps less useful than for other areas because permit holders report using few Project Area streams. Field interviews indicated that Elevenmile Creek and other streams in the western part of the Project Area are used for fishing, yet no permits were reported for use in these waters. Only

four Project Area-related streams appear in ADF&G permit statistics (included in the tables below along with "location not specified"). Although not actually within the Project Area, all are potentially affected by activities within the Project Area.

For the most part, subsistence resources have been discussed primarily in terms of fish and wildlife. In part, this is due to the fact that these subsistence resources are perceived (by users as well as researchers) to be most at risk. It is also partly due to the fact that information on the use of other subsistence resources is less well developed than for fish and wildlife. Some rural residents certainly rely on wood for heat, cooking, and cabin construction; plants for food and medicine; and various other resources for craft and other utilitarian uses. With few exceptions, the people interviewed during subsistence field work conducted for the Project Area did not think that other resources or uses would be much affected by the proposed action. The major exception was the Western Peninsula area of WAA 1323. The coastal areas of this WAA are important for the collection of seaweed, shellfish, marine mammals, and other resources, particularly by the residents of Klawock. More interior areas are important for the collection of other vegetable resources.

Table 3-49

Average Yearly Number of Subsistence/Personal Use Permits Used in Selected Locations and Average Salmon Harvest by Species by Community (1985 to 1993)

	Location of Permit							Salmon Harvest by Species			
Community	Not Specified	Shinaku Creek	Thorne River	Klawock River	Karta River	Other	Total Permits	Sockeye	Coho	Pink	Chum
Coffman Cove	3	0	0	0	0	3	6	63	0	0	0
Craig	70	0	0	41	17	47	175	1,745	5	83	22
Hollis	1	0	0	0	3	1	5	75	0	2	0
Hydaburg	16	0	0	1	1	40	58	1,205	6	45	5
Ketchikan	116	0	1	20	91	214	442	6,467	18	416	358
Klawock	31	0	0	79	2	15	127	2,072	17	175	106
Metlakatla	No Permits reported — Special status as a reservation										
Naukati	No permits reported										
Saxman	1	0	0	0	0	0	1	5	0	0	0
Thorne Bay	29	0	3	1	1	38	72	766	2	20	5
Whale Pass	1	0	0	0	0	2	3	39	0	10	0
Other	0	0	1	13							

SOURCE: Personal Communication, Gary Timothy, ADF&G, Commercial Fisheries, Juneau, 1994.

This page intentionally left blank.

Cultural Resources

Key Terms

Cultural resources—all evidence of past human-related activity. It may be historic, prehistoric, architectural, or archived in nature. Cultural resources are nonrenewable aspects of our national heritage.
Sensitivity zone—defined as "high," "medium," or "low," based on the probability that they might contain cultural resources.
SHPO—State Historic Preservation Officer.

Introduction

Few archaeological sites have been excavated and analyzed in Southeast Alaska; consequently, the prehistory is understood in only its broadest outlines. Most of the work has been done on Baranof, Admiralty, and Chichagof islands, and the Chilkat Peninsula. Four sites have been excavated on Prince of Wales Island, three on Heceta Island, and one on Kupreanof Island. With this limited database, the conclusions drawn must necessarily be broad, even on a regional scale. Several labels have been applied to the apparent chronological divisions observed in recovered artifacts; however, only the most recent categories (Davis, 1990) will be used for the following discussion.

Ethnohistory of Project Area

Prehistory

Radiocarbon dates of paleontological remains indicate that portions of the Control Lake Project Area were apparently free from glacial ice at least 11,000 years ago. The earliest evidence of human occupation of central Prince of Wales Island is approximately 8,000 years ago at the Thorne River site, along the Thorne River near the eastern edge of the Project Area.

The Paleomarine Tradition (10,000 to 6,500 Before Present [B.P.]) is the earliest recognized cultural tradition (Table 3-50). Sites or components of sites assigned to this tradition contain microblades, wedge-shaped microblade cores, and few or no bifacially flaked stone tools. Animal remains at these sites include fish bone and marine shell, indicating a coastal marine subsistence (Davis, 1990). The Thorne River site on Prince of Wales Island is assigned to the Paleomarine Tradition (Holmes, 1989), as are two excavated sites on Heceta Island (Ackerman et al., 1985).

As its name implies, the Transitional Stage (6,500 to 5,000 B.P.) represents a transition between the technology of the Paleomarine Tradition and that of the later Developmental Northwest Coast Tradition. Faunal and floral remains and the inland location of some sites suggest adaptation to a changing environment (Davis, 1990).

The Developmental Northwest Coast Tradition (5,000 B.P. to contact) contains multiple phases and is distinguished from the Transitional Stage by the presence of shell midden deposits, ground stone and bone technology, human burials, larger settlements (winter villages), specialized subsistence camps, fortifications, and native metal (Davis, 1990). The Coffman Cove and Sarkar Cove sites and Yatuk Creek Rockshelter, north of the Project Area in the central portion of Prince of Wales, and Rosie's Rockshelter on Heceta Island contain components from this tradition (Ackerman et al., 1985; Arndt et al., 1987; Clark, 1979a, 1979b, and 1980; Rabich-Campbell, 1984). The beginning of this tradition possibly corresponds to the entry of the contemporary Native population, known as the Tlingit, into the area.

Table 3-50
Cultural Chronology

Tradition	Date	Cultural Material	Selected Sites
American Historic	A.D. 1867	Modern tools, structures, and social systems. Gold discovered in SE Alaska in 1869	Numerous
Russian Historic	A.D. 1798	Historic fur trade goods; metal tools, glass, ceramics, beads. Trade as early as 1750	Numerous
Developmental NW Coast Late Phase	1000-1750 B.P.	Native copper, stone vessels Increased use of obsidian, rise of fortified sites and villages	Starrigavan, Russian Cove, Old Town, Yatuk Creek Rockshelter
Developmental NW Coast M Middle Phase	3000-1000 B.P.	Unilaterally barbed points, Nephrite, ground burins, toggling harpoons, small end blades	Hidden Falls, Sarkar Entrance, Young Bay, Yatuk Creek Rockshelter, Portage Arm
Developmental NW Coast Early Phase	5000-4000 B.P.	Ground stone, bone, Woodworking tools	Hidden Falls, Rosie's Rockshelter, Coffman Cove, Traders Island
Transitional Stage	6500-5000 B.P.	Ground stone, bifacial flaked stone	Lake Eva, Chuck Lake, Irish Creek
Paleomarine	10,000-6,500 B.P.	Unifacial flaked stone, cores, Blades, fish bones, marine shell	Hidden Falls, Chuck Lake, Thorne River, Ground Hog Bay

SOURCE: Davis, 1990.

Although the exact dates of occupation are not known, the Tlingit were well established in Southeast Alaska by the time of first Russian contact. The settlement and subsistence patterns of the Tlingit demonstrate a long-term adaptation to their environment.

Prince of Wales Island was formerly divided among several subgroups of Tlingits: the Stikine (Shtax'heen Kwaan) included the northeast coast in their territory; the Henya (Heinyaa Kwaan) inhabited the northern half of the western part the island; the Klawock (Lawaak Kwaan), who may also have been part of the Henya, resided along the west central coast; and the Tongass (Taant'akwaan) held the southern third of the island before the Kaigani Haida displaced them (about 1700 A.D.) to a small section along the coastline of southern Southeast Alaska and islands to the east (Arndt et al., 1987).

Unlike the mainland Tlinglit groups which established permanent villages that they used throughout the year, Tlinglits on the islands used villages only from November through March (Oberg, 1973). The island villages were situated in sheltered areas from which they exploited land-based resources such as land mammals and timber (for canoes). These were also the locations of major ceremonies. In March, people would move to the outer islands to harvest seals, deep sea fish, shell fish, and birds eggs. From July through October, the primary subsistence focus was sockeye salmon. Other activities included trading, raiding for slaves, harvesting berries, and hunting land mammals (Ackerman et al., 1987; Langdon, 1977).

History

Beginning in the late eighteenth century, Russian, British, French, and American explorers and fur traders established contact with the Tlingit of Prince of Wales Island. Outside explorers brought disease—smallpox, typhoid, and measles—which had a significant impact on the Native population. Survivors of the severe smallpox epidemic of 1835-1838 moved from small villages to larger ones (De Laguna, 1972, 1990). This consolidation likely occurred on Prince of Wales Island as well, resulting in the abandonment of traditional villages and the relocation to non-Native towns and canneries.

Between 1872 and 1886, several events occurred at Klawock that affected the traditional life of the Tlingit. These include the establishment of a saltery in 1872, a cannery in 1878 (the first on Prince of Wales Island), and a school with a teacher by 1886 (Mobley, 1993; Selkregg, 1976). By 1900, the remaining Tlingit from Tuxekan had moved to Klawock (Davis, 1977). The next non-Native development in the area was a substantial mining effort, followed finally by the timber industry. The introduction of these industries allowed many Natives to supplement their traditional, subsistence way of life with wage labor (Arndt et al., 1987; De Laguna, 1990). Logging, mining, and the development of cottage industries to accommodate a growing tourist market also provided opportunities for Natives to work for pay.

As supported by written records and archaeological evidence, acculturation had little effect on the Tlingit way of life until the influence of American industry in the late nineteenth century. By 1900, Native people had shifted from their traditional village life and relocated for wage labor. However, canneries like that at Klawock were starting to replace Native laborers with cheaper Chinese laborers, although there was still employment for the Natives as fisherman (Moser, 1902).

The U.S. Fish Commission first compiled reports on salmon-related activities on Prince of Wales Island in 1897. Earlier reports by special agents of the Treasury Department indicate that the Klawock cannery was very active in 1893. In 1905, a total of 177 employees were reported by North Pacific Trading and Packing Company in Klawock, including 98 Natives.

The Department of Commerce and Labor Bulletin from 1906 regarding coho salmon, records fishing in Klawock Inlet and Tonowek Bay in 1900 and from 1904 to 1906, and in the Gulf of Esquibel in 1906 (House Document No. 356, 1907). While actual fishing was taking place offshore and in the streams of Prince of Wales Island, the industry brought people, buildings, and work to the island. The Tlingits went to work for the canneries, moving from their Native villages to settlements around the canneries (De Laguna, 1990). Thus, the fishing industry played a large role in the acculturation of the Tlingit and their shift in emphasis from a subsistence way of life to one of wage labor.

The first copper prospect on Prince of Wales Island was located in 1867. Since then, more than 40 mines have operated in the Ketchikan mining district; the Kasaan Peninsula has been

one of the major and most productive lode mining areas up to the early 1940s. Two of the more productive Kasaan mines, located closest to the Project Area, are the Salt Chuck, which operated intermittently from 1907 to 1941, and the Rush and Brown, which operated between 1906 and the 1920s. Copper mines and prospects were also operated in the late 1800s and early 1900s in the Hollis, Hetta Inlet, and Niblack/Dolomi areas (Rakestraw, 1981).

In the late nineteenth century, prospectors also discovered that Southeast Alaska was rich in nonmetallic, nonfuel resources used in industry and construction. The first discovery was marble, and three quarries were eventually established in the northern Prince of Wales area. Between 1897 and 1902, individuals staked claims for areas on Marble Creek at Calder, Dry Pass at El Capitan, and Red Bay. The sale and production of marble from Southeast Alaska steadily increased from 1904 to 1926 (Roppel, 1991), but by 1932 demand was no longer great enough to keep the Southeast Alaska quarries open.

The timber industry has also had significant impacts on Southeast Alaska, the physical remains of which can still be seen in the central Prince of Wales area. The earliest logging and milling operations in the area were connected with salteries and canneries at Shakan and Klawock. By 1889, both steam and water sawmills were reported in Klawock along with a water mill at Shakan which produced timber for docks and buildings and lumber for boats, barrels, and boxes. These mills and others in Southeast Alaska also produced timber used in copper mine and marble quarry operations (Rakestraw, 1981).

President Theodore Roosevelt initiated the Federal presence in the forests of Alaska. From the beginning of his presidency in 1901, Roosevelt was interested in creating forest reserves in Alaska. He asked renowned Alaskan expert Lt. George Thornton Emmons to prepare a report on the potential of such an undertaking. Emmons recommended considering several areas of Southeast Alaska, including Prince of Wales Island. In 1902, a presidential proclamation reserved the lands that Emmons suggested and the Alexander Archipelago Forest Reserve was created (Arndt et al., 1987; Rakestraw, 1981).

During that time the population of the Forest Reserve was limited largely to Alaska Natives and employees of the mining and fishing industries. On Prince of Wales Island, timber was used by the mine and quarry operators for buildings and railroads and by the fishing industry for their wharves, buildings, and netting constructions. While no sawmills were located in the current Project Area, a mill existed at Klawock, and another just to the north in Shakan in 1905 and one was built at Craig in the 1910s. All geared their output to mining, quarrying, and fishing operations (Rakestraw, 1981).

In July 1908 the Tongass National Forest assumed control of the Alexander Archipelago Forest Reserve with a combined area totalling 6.2 million acres. Timber sales grew along with salmon fishing. Following passage of the Antiquities Act of 1906, Forest Service personnel were encouraged to report outstanding examples of cultural properties. As a result, the totem poles and community houses at Tuxekan and Old Kasaan were recommended for in situ preservation (Rakestraw, 1981).

Timber sales from the area flourished from the 1920s through the 1940s, due in part to demands by Civilian Conservation Corps (CCC) work projects and, later, World War II. While pulp production had been attempted at an earlier date, it was not until after World War II that large-scale pulp production became feasible in Southeast Alaska, once again increasing timber sales and production in the area (Arndt et al., 1987; Rakestraw, 1981).

The Native Tlingit historically have used the trees for building homes and making canoes, and they hunted in the forests from the beginning of their occupation. The influx of mining and

fishing industries with European and American backing increased the need for processed lumber. The sawmills at Klawock and Shakan were built in the late 1800s to meet these needs. With the withdrawal of the area as part of the Tongass National Forest, lumber interests began seeking a wider business market abroad.

In the 1930s, the Indian Reorganization Act incorporated some villages, such as Klawock, and aided them in acquiring land and sawmills (De Laguna, 1990). Then, in 1971 under the ANCSA, the Tlingit and Haida formed the Sealaska Regional Corporation in ten remaining historic villages (De Laguna, 1990). Although industry brought about changes in the life ways of the Tlingits, resulting in a decline in traditional values, tribal identity has not been lost. The clan system, singing and dancing, Native crafts, and death customs have experienced a strong revival since the 1970s.

The traditional practitioners among the Tlingit people who have settled in Klawock and Craig maintain strong connections with specific locations and general areas along the west coast of Prince of Wales Island. Research by anthropologists since the early 1900s has documented the strong ties to the coastal areas, as well as small and large off-shore islands (Garfield and Forrest, 1948; Langdon, 1977; R. L. Olson, 1967; W. M. Olson, 1989; Peratrovich, 1959; Sealaska, 1975; Swanton, 1908). The best information specific to the west coast portion of the Project Area was presented at the Control Lake Project Scoping Meeting (October 18, 1993) (Enserch Environmental, 1994). Resources hunted or gathered, by location, include abalone, sea cucumbers, sea ribbons, chiton, and seaweed along the Elevenmile shore; coho salmon from streams either side of Blanquizal Point; coho, sockeye, and humpback (pink) salmon from Salt Lake Bay; wild asparagus from the southern end of Salt Lake Bay and southeastern end of Nossuk Bay; sea cucumber along the southern shore of Nossuk Bay and south along the coast for one or two miles; king salmon south from Salt Lake Bay for 10 miles; Dungeness crab and fish trapping south of Blanquizal Point; swamptea berries in the interior near the south end of VCU 592; and deer in the hills in the interior in September and October. While scoping comments at the Klawock meeting did not address religious practices in the area, people at the meeting acknowledged that the ability of the Tlingit to hunt and gather in the west coast area was connected to the cultural well being of the group.

Control Lake Cultural Resource Inventory

Cultural survey work

A discussion of previous cultural resource surveys can be found in Greiser (1994). These surveys provided a starting point for the Control Lake cultural resource inventory. The cultural resources study for the Control Lake Project Area was designed to satisfy Federal and State resource management legislation as summarized in regulations prepared by the President's Advisory Council on Historic Preservation (36 CFR, Part 800). These regulations encompass the requirements of Section 106 of the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, and FSM 2300, among other laws and regulations. The cultural resource inventory plan, consistent with Forest Service and Alaska Heritage Resource Survey (AHRS) guidelines, included pedestrian examination of the ground surface, along with subsurface investigation where necessary, to recover adequate data to assess the potential for significant resources in the proposed timber sale area. The objectives of the technical study included:

- Inventory known cultural resources through background research; locate additional sites in the Project Area based on an approved inventory plan including intensive survey of proposed harvest units and roads in high probability areas; survey additional blocks of land outside harvest units in high probability areas; and attempt to relocate previously recorded sites for detailed recording and evaluation in areas that might be subjected to increased activity.
- Evaluate the significance of located cultural resource sites in terms of the National Register of Historic Places criteria.

- Determine the potential effects of each project alternative on significant sites and compare effects among the alternatives.
- Recommend measures to mitigate potential adverse effects on significant resources and discuss the possible effectiveness of the measures.

This chapter discusses the first two objectives. Chapter 4 contains the findings relating to items 3 and 4. A detailed discussion of the cultural resources inventory methods are contained in Greiser (1994). A discussion of the existing cultural resources inventoried follows.

Project Area Cultural Resources

The project inventory identified a total of 41 cultural resource properties within the Project Area (Table 3-51), of which 39 required full recording and evaluation. Two properties were on land conveyed to the State of Alaska and were not subjected to subsurface testing, full recording, or detailed mapping, based on an agreement between the Forest Service and the Alaska State Historic Preservation Office (SHPO). Thirteen of the properties, numbered between CRG-086 and CRG-302, had been previously located and at least minimally recorded.

A fourteenth previously located cultural resource property in the Project Area, the Thorne River Site (CRG-177), has been determined eligible for the National Register of Historic Places and subjected to the mitigation of road construction impacts through a data recovery plan (Holmes, 1989).

Three previously located properties (CRG-197, CRG-370 and CRG-371) were reported to be in the Nossuk Bay area, but were not relocated during the Control Lake Project survey and subsurface probing. The first property appears to be the subject of incorrect locational information. The problem with the other two properties may be that the recording forms were completed by a second person 10 years or more after the original investigator made notes about the properties. Also, locational information may have been incorrectly recorded or the properties may have been eroded or covered with sediments.

The cultural resource inventory in the Control Lake Project Area relocated 13 of the 17 previously reported properties listed in AHRS files and located and recorded 28 new properties. At this time none of the properties has been specifically identified as a traditional cultural/religious property, but reported use of the area by Tlingit people from Klawock and Craig may include currently undocumented traditional cultural places.

Table 3-51 summarizes the cultural resource properties confirmed or located during project fieldwork. These include: two bluff-top, defensive locations or fortifications with associated middens; 26 campsites (shell midden deposits)—three in rockshelters, two with associated canoe landings, and one with an associated stonefish weir; one lithic material campsite of Paleomarine Tradition; seven canoe landings, one with associated petroglyphs and one with an associated fish trap; four stonefish weirs in Salt Lake Bay, one of which is very elaborate; one carved cedar-log location; and one historic habitation, a cabin or log tent base. Unconfirmed cultural resource properties in the Project Area include two mining-related properties, two shell midden deposits, and one wood-stake fish weir.

Thirty-one of the properties fully recorded and evaluated during 1993 fieldwork are recommended as eligible for listing on the National Register of Historic Places as part of a proposed multiple property group. The two properties located during the inventory on land conveyed to the state of Alaska on Salt Lake Bay, although not fully tested and recorded, are likely to be eligible as part of the multiple property group. One property, the Thorne River Site (CRG-177), has been determined to be eligible for listing on the National Register and a major portion of it was subjected to data recovery.

Table 3-51

Known Cultural Resource Properties Within the Control Lake Project Area

Property (Site) Numbers			
Field Number	**AHRS Number**	**Property Site Type**	**Cultural Affiliation**
29-3[1]	CRG 425	Campsite	Aboriginal
29-4	CRG 163[2]	Cedar Carving	Aboriginal
32-11[1]	CRG 426	Rockshelter Campsite	Aboriginal
37-4	CRG 198[2]	Canoe Landing	Aboriginal
39-3[1]	CRG 429	Campsite	Aboriginal
39-4[1]	CRG 428	Campsite	Aboriginal
39-5[1]	CRG 427	Campsite	Aboriginal
42-3	CRG 196[2]	Fortification	Aboriginal
42-7	CRG 086[2]	Campsite, Canoe Landing	Aboriginal
591		CRG 197[3]	Campsite(?)
Aboriginal			
	CRG 370[3]	Campsite(?)	Aboriginal
	CRG 371[3]	Wood Stake Fish Weir(?)	Aboriginal
11-1[1]	CRG 409	Fortification	Aboriginal
12-1 to 12-14	CRG 302[2]	Canoe Landing, Petroglyphs	Aboriginal
13-1/13-2[1]	CRG 410	Fish Trap, Canoe Landing(?)	Aboriginal
14-1[2]/14-2[1]	CRG 299	Campsite, Stone Fish Weir	Aboriginal
14-5[1]/14-7[2]	CRG 298	Campsite, Canoe Landing	Aboriginal
15-2	CRG 295[2]	Canoe Landing	Aboriginal
15-3	CRG 296[2]	Canoe Landing	Aboriginal
15-4	CRG 297[2]	Canoe Landing	Aboriginal
15-1[1]	CRG 411	Rockshelter Campsite	Aboriginal
16-1[1]	CRG 412	Campsite	Aboriginal
19-5[1]	CRG 413	Campsite	Aboriginal
20-1[1]/20-4[1]	CRG 414	Stone Fish Weir	Aboriginal
20-7[1]	CRG 415	Stone Fish Weir	Aboriginal
20-9[1]	CRG 416	Campsite	Aboriginal
22-3	CRG 225[2]	Stone Fish Weir	Aboriginal
22-5[1]	CRG 417	Stone Fish Trap & Weir	Aboriginal
24-6	CRG 224[2]	Campsite	Aboriginal
24-7[1]	CRG 418	Campsite	Aboriginal
25-3[1]	CRG 421	Campsite	Aboriginal
25-5[1]	CRG 420	Campsite	Aboriginal
25-6[1]	CRG 419	Campsite	Aboriginal
26-3[1]	CRG 422	Log Cabin or Tent Base	Historic
27-4[1]	CRG 423	Campsite	Aboriginal
28-2[1]	CRG 424	Rockshelter Campsite	Aboriginal
1-3[1]	CRG 402	Campsite	Aboriginal
2-2[1]	CRG 404	Campsite	Aboriginal
2-4[1]	CRG 403	Campsite	Aboriginal
3-1[1]/3-2[1]	CRG 406	Canoe Landing	Aboriginal
3-3[1]	CRG 405	Campsite	Aboriginal
5-1[1]	CRG 407	Campsite	Aboriginal
5-4	CRG 194[2]	Campsite	Aboriginal
6-1[1]	CRG 408	Campsite	Aboriginal
	MN 70[5]	Mining Claim	Historic
	MN 77[5]	Mining Claim	Historic
	CRG 177[4]	Campsite	Aboriginal

1/ Property located and recorded as part of current study.

2/ Previously located property relocated and evaluated as part of current study.

3/ Previously located property searched for, but not relocated as part of current study.

4/ Previously located and evaluated property.

5/ Mining claim

Characteristics of Cultural Resources

Settlement Patterns

There is a clear pattern of distribution of aboriginal properties along the coastal portion of the Project Area. The areas most likely to have been occupied aboriginally are the low areas of coastline, especially those containing salmon streams, that provide off-shore island protection from major ocean storms, or large bays. Conversely, the rugged, exposed sections of coast were generally not habitable on a long-term basis.

Chronological Distribution

Forty-three radiocarbon dates have been obtained on charcoal and shell samples from 26 properties along the west coast of the Project Area. The dates range from 150 to 3460 B.P., uncorrected, and without standard deviations. The oldest cluster of dates consists of six samples dated between 2650 and 3500 B.P.; five of the six dates came from four properties around Nossuk Bay, including a fortification. Nine of the dated samples are distributed between 990 and 1630 B.P. The remaining 28 dates range from 150 to 900 B.P., with nine of those (21 percent of all the dates) between 800 and 900 B.P.

The ten dates for the cluster of properties in the Elevenmile Creek area range from 580 to 3240 B.P., with four in the 800 to 900 B.P. range. CRG-402, the most deeply stratified property tested, contains the oldest dated level for this cluster. The 10 dates for the cluster of properties lying north of Blanquizal Point peninsula range from 230 to 1780 B.P. The oldest three dates in this cluster (1510 to 1780 B.P.) are from properties south of the mouth of Salt Lake Bay. The eight dates from properties around Salt Lake Bay range from 150 to 1210 B.P. The lack of clustering in the dates indicates the bay has been used continuously for at least the past 1,200 years. The two dates obtained from properties along the coast between Salt Lake and Nossuk bays are 640 and 850 B.P. Thirteen dates from properties around Nossuk Bay range from 250 to 3460 B.P. In addition to the five dates at the older end of this range, five dates from four properties range from 250 to 410 B.P., indicating at least two peaks of occupation of the bay. The repeated or continued occupation of Nossuk Bay may be related to the bay's location on the boundary between two Tlingit clan territories.

Subsistence

Test units at 14 of the properties contained fish remains in one or more of the subsurface levels. The sample of scales and nearly 2,200 bones contains evidence of 14 taxa of very large to quite small fish. The most productive test unit for fish remains was at CRG-403 (58 percent of all fish remains), with CRG-412 containing the second most productive test unit (13 percent). Bones from large cod or pollock dominated the remains at both of those properties. Between 8 and 20 percent of the fish remains recovered from CRG-403, CRG-405, CRG-409, CRG-224, and CRG-196 were salmon bones. Comparing dated levels within and between properties, salmon, cod and pollock appear to be equally represented through time. Small flatfish tend to be more frequent in the older levels of properties. Herring, identified primarily through scales at CRG-412 and bones at CRG-408 and CRG-409, may be under-represented in material collected from test units, since maximum recovery of their small remains requires fine screens.

Fifteen of the properties also produced mammal remains from one or more levels of test units. Generally the bone is heavily fragmented either due to processing for consumption or post-occupation natural deterioration. Most of the identifiable bone is from land mammals, primarily deer; the only sea mammal bone represented, appears to be the bone harpoon from CRG-196. A few bird bone fragments were also recovered.

The most abundant cultural remains collected from properties in the Project Area is shellfish, particularly bivalves. Twenty-three of the 26 tested properties produced shell. Four of the properties produced shell from only two or three levels in test units, while the rest produced shell from 4 to 11 levels. While identifiable shell was present in nearly every property, one property contained only unidentifiable shell fragments in each level. Mussel shell and charcoal, because of their friable nature, tended to be the key indicators of subsurface cultural deposits in the small diameter soil auger probes. This tendency to fragment easily means that mussel shell is under-represented in the recovered samples. The most common bivalves in the collections are the Pacific littleneck clam and the butter clam. Fat gapers consistently occurred in small numbers in each sample, while seven additional bivalve species occurred sporadically. Non-bivalves occurred in low frequencies, with snails, periwinkles, welks, limpets, and chitons the most consistent. The majority of shellfish recovered during testing occur naturally in the sand and gravel or on rocks in the intertidal zone or are exposed or nearly exposed at unusually low tides.

National Register Registration Requirements and Recommendations

The properties located and recorded as part of the Control Lake EIS cultural resource study were evaluated for eligibility for listing on the National Register of Historic Places (36 CFR Part 60.4). Most of the properties recommended as eligible (Table 3-52) for the National Register are eligible under criterion D (the properties have yielded, or have the potential to yield, information important to prehistory or history). Property types, including middens, campsites, fortifications, and the one historic feature are recommended as eligible when one or more intact occupation surfaces are determined to be present, primarily through testing. The intact deposits have the potential to yield artifacts of chronological, economic, ritual, or ethnic significance. Biotic remains can provide information about aboriginal diet, season of occupation, climate, and, perhaps, ritual life. Charcoal and other organic materials provide chronometric data. Intact features such as cooking fires can provide information on diet and resource processing, while house remains can be used to address domestic spatial organization.

Petroglyphs are recommended as eligible under criterion C on the basis that they may represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction. Petroglyphs are rare in the Project Area; in other parts of Southeast Alaska they have been interpreted to be connected with clan ownership of an area and/or represent part of a ritual used to ensure good salmon harvests.

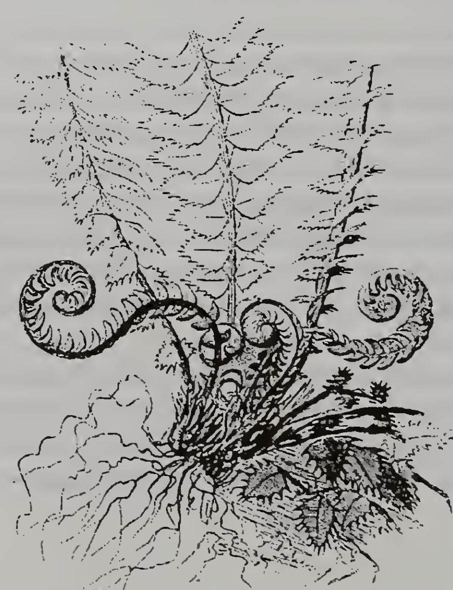
Campsites recommended as ineligible lack intact or undisturbed subsurface deposits. While deposits are present and have been subjected to radiocarbon dating, the properties do not have the potential to yield data beyond what was gathered during recording and testing. Canoe landings and fish weirs are recommended as ineligible if the majority of the features present are not intact and the information potential is better represented at properties with intact features. The log base for the cedar carving is recommended as ineligible because the carving was removed. This recommendation could change if information is obtained regarding the status of the location as a traditional cultural property.

The eligible properties are recommended as a National Register of Historic Places Multiple Property to address the significance of a group of related properties. This format recognizes the importance of the known properties and allows for inclusion of properties located in the future in or near the area. On the basis of current research, the section of the coast of Prince

of Wales Island inventoried by the Project Team was part of the territory occupied and used by the Henya Tlingit, many descendants of whom now live in Klawock and Craig and still use the area.

Table 3-52
National Register of Historic Places Recommendations or Status for Cultural Resource Properties in the Project Area

Property Type	Listed	Eligible		Ineligible	Undetermined
Campsites	CRG-177	CRG-194	CRG-419	CRG-404	CRG-413
		CRG-224	CRG-420	CRG-407	CRG-416
		CRG-402	CRG-421	CRG-423	
		CRG-403	CRG-425		
	CRG-405	CRG-427			
		CRG-408	CRG-428		
		CRG-412	CRG-429		
		CRG-418			
Fortifications		CRG-196	CRG-409		
Rockshelter					
Campsites		CRG-411	CRG-426		
		CRG-424			
Campsite, Canoe Landings			CRG-086	CRG-298	
Canoe Landings		CRG-406		CRG-198	
				CRG-295	
				CRG-296	
				CRG-297	
Canoe Landings, Petroglyphs		CRG-302			
Fish Trap, Canoe Landing				CRG-410	
Campsites, Fish Weirs		CRG-299			
Fish Weirs		CRG-415		CRG-225	
				CRG-414	
Fish Traps, Fish Weirs				CRG-417	
Cedar Carving				CRG-163	
Log Cabin/Tent Base		CRG-422			
TOTAL		27		12	2



Visual

Key Terms

Background—the distant part of a landscape; the seen, or viewed area located from 3 to 5 miles to infinity from the viewer.
Character type—an area of land that has common distinguishing visual characteristics of landform, rock formations, water forms and vegetative patterns.
Characteristic landscape—usually a small portion of a character type that visually represents the basic vegetative patterns, landforms, rock formations and water forms which are in view.
Cumulative visual disturbance—the percent of a viewshed's seen area in a disturbed condition at any point in time.
Distance zone—divisions of a viewed landscape by foreground, middleground, and background zones.
Foreground—portion of viewed area from immediately adjacent to the viewing position to about a half mile from the observer's position; individual branches of trees are discernible.
Maximum Modification—a VQO which prescribes that an area may be dominated by management activities, but resulting visual characteristics should appear as a natural occurrence when viewed from the background distance zone.
Middleground—the visible terrain beyond the foreground from about 1/4 mile to 3 to 5 miles from the observer's position; individual trees are still visible but do not stand out distinctly from the landscape.
Modification—a VQO in which management activities may visually dominate the original characteristic landscape, but resulting visual characteristics must resemble natural occurrences within the surrounding area when viewed from the foreground and middleground distance zone.
Not seen—a mapping category associated with distance zones. Sensitivity Level 3 travel routes, use areas, and areas not seen or seldom seen from Visual Priority Routes and Use Areas have been mapped as Not Seen in the visual inventory. Also referred to as "Seldom Seen."
Partial Retention—a VQO in which management activities are to remain visually subordinate to the natural landscape.
Preservation—a VQO which permits ecological changes only; applies to wilderness areas and other special classified areas.
Retention—a visual quality objective which provides for management activities that are not visually evident to the casual observer.
Sensitivity level—a three-level measure of people's concern for the scenic quality of an area.
Unacceptable Modification—does not meet a VQO of Maximum Modification. Excessive modification due to management activities in which the design, size, extent, or duration are poorly related to the scale of landform and vegetative patterns in the characteristic landscape may result in unacceptable modification.
Variety class—classification of the landscape by the diversity and scenic quality of the natural landscape. The three classes are: Class A - Distinctive; Class B - Common; Class C - Minimal.
Viewshed—a defined landscape or panoramic vista seen from one or more specific viewpoints.
Visual Absorption Capacity (VAC)—an estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.
Visual priority routes and use areas—the designated priority routes and use areas from which the proposed VQO's will be applied. Nonpriority travel routes and use areas, and those areas not seen from the Visual Priority Routes and Use Areas, are managed according to "Not Seen" criteria.
Visual Quality Objective (VQO)—management standards reflecting five degrees of acceptable alteration of the natural landscape based on a landscape's diversity of natural features and the public's concern for scenic quality.

Introduction

An important aspect of Southeast Alaska's natural resource base is its attractive setting. The importance of this scenic splendor is evident in increased tourism and a heightened concern for scenic resource values by Alaska's residents. The Visual Management System (VMS), developed by the Forest Service, inventories these scenic resources and provides measurable standards for their management. Initially, the VMS assesses the relative scenic quality (visual character type and variety class) of the Project Area, as found in its current state. The VMS then assesses viewer sensitivity levels based on the type and use of these landscapes.

Scenic quality, sensitivity levels and management goals are combined to establish VQO's. These parameters are also used to define the Existing Visual Condition (EVC). As set forth in the 1997 TLMP, the Desired Future Condition (DFC) describes how the Forest should appear in the future. The DFC for the Control Lake Project Area emphasizes landscapes with a modified appearance to a greater degree than for the Tongass National Forest as a whole. Together with other resource-related goals, objectives, and management prescriptions, these criteria help govern the location, design, and scheduling of management activities such as timber harvest in an attempt to achieve the DFC defined in the 1997 TLMP.

Visual Character Types

Visual character types describe landscapes that have common landform, rockform, water features, and vegetation. The southern reaches of the Tongass National Forest, including the Control Lake Project Area, are represented by the Coastal Hill and Kupreanof Lowland visual character types. Extensive landform variety exists in the Coastal Hill type and elevations range from 1,000 to 4,500 feet (Figure 3-33). Areas with elevations less than 3,500 feet were glaciated and have rounded, hummocky summits, knobs, and ridges. The communities of Thorne Bay, Craig, and Klawock are adjacent to the Project Area and within the Coastal Hill character type. Substantial timber harvest activities are evident on central Prince of Wales Island.

The Thorne River (Honker Divide) area, which contains a regionally significant and nationally recognized canoe route, lies within the Kupreanof Lowland visual character type. The landform in this type is rolling, heavily glaciated, and has a maximum relief of 1,000 to 1,500 feet (Figure 3-34). Scattered block-like mountains with rounded, hummocky summits of 2,000 to 3,000 feet in altitude rise above the general level of the lowlands.

Scenic Quality

Having defined the Project Area's character type, the next step is to assess the relative scenic quality of all landscapes. Landscapes are rated as follows:

Scenic Quality	Rating
High	Variety Class A
Average	Variety Class B
Low	Variety Class C

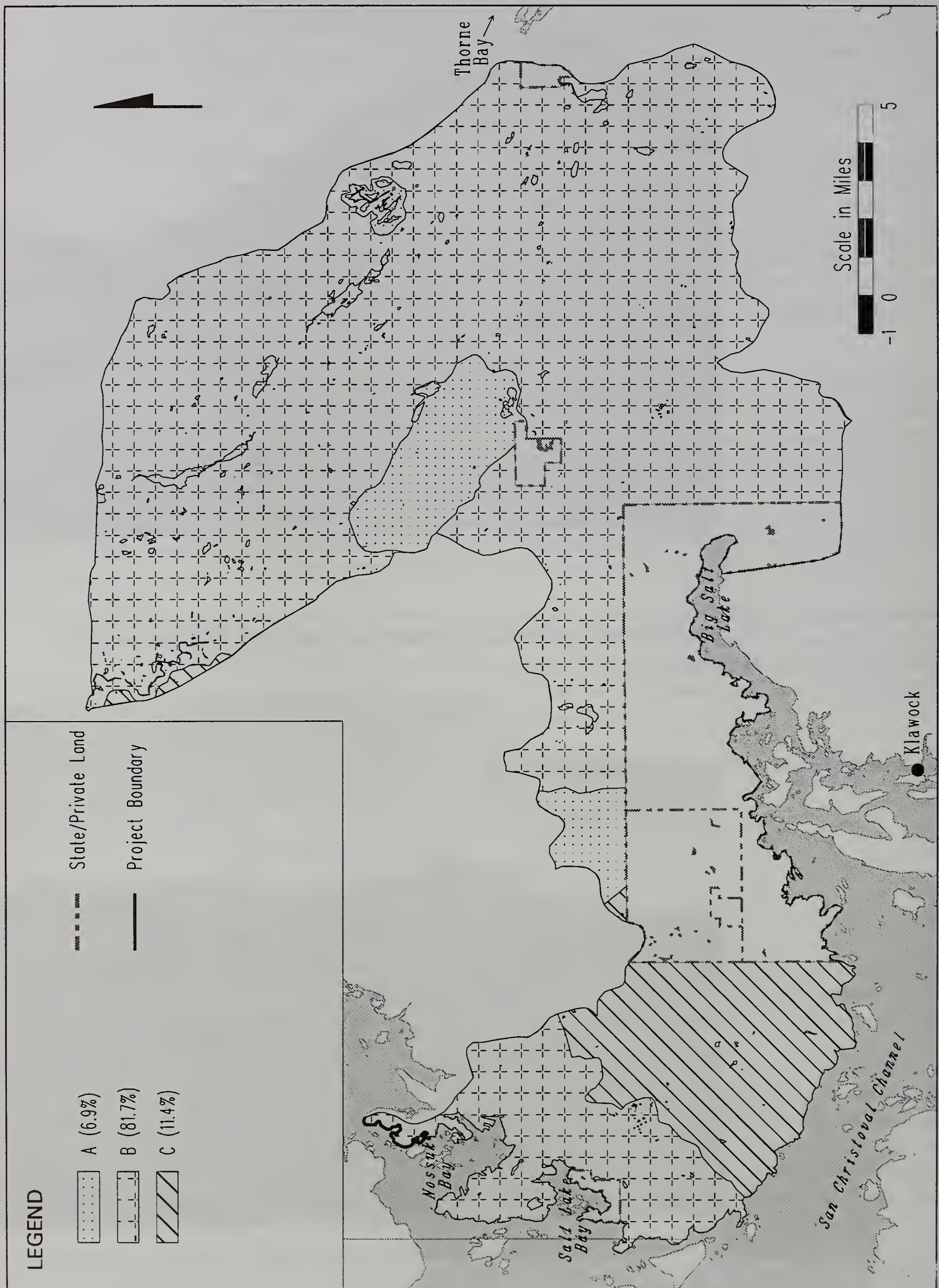
These ratings are based on the diversity of natural landform, rockform, waterform, and vegetation. All ratings are made relative to the overall character of the larger Kupreanof Lowland and Coastal Hill visual character types. Variety classes of the Project Area are shown on Figure 3-35.

An intricate network of interlacing waterways, muskegs, and complex shorelines results in a high scenic quality (Variety Class A) designation for Snakey Lakes. While continuously wooded, the southern flank of Kogish Mountain and an area bounded by Cutthroat Lakes and Balls Lake contain steep slopes and enough variety in landform to also be deemed Variety Class A. These areas account for 6.9 percent of the project's acreage on National Forest System lands.

Figure 3-35
Typical Scenery in the Coastal Hill Portion of the Project

Figure 3-36
Typical Scenery in the Kupreanof Lowland Portion of the Project

Figure 3-35
Variety Classes in the Control Lake Project Area



Most of the remaining land (81.7 percent), including the Thorne River drainage, is of average scenic quality (Variety Class B). However, lack of water features, topographic relief, and vegetative diversity combine to give much of the Kogish Roadless Area a low scenic quality (Variety Class C) designation.

Visual Sensitivity

The third part of the VMS measures the concern of National Forest visitors for scenic quality, as seen from recreation use areas, communities, travel routes (marine and land), anchorages, and cabins. Ratings are based on the type and frequency of use, and are categorized as Highest Sensitivity (Level 1), Average Sensitivity (Level 2), and Lowest Sensitivity (Level 3). The percentage of the Project Area in each Sensitivity Level is graphically depicted in Figure 3-36.

Sensitivity Level 1 areas (14.7 percent of the Project Area on National Forest System land) include those seen from principal recreation areas, major marine travel routes and communities. Within the Control Lake Project Area this includes the Forest Highway #9 (Forest Road 30) corridor, Thorne Lake (and Honker Cabin), Balls Lake, Control Lake, portions of the West Coast Waterway (south of about St. Philip Island), and the waters around Craig and Klawock (San Alberto Shinaku Inlet, Klawock Inlet, and Big Salt Lake).

Sensitivity Level 2 (10.8 percent) is assigned to landscapes seen from moderately used recreation areas, boat routes, anchorages, and roads. This includes the eligible scenic and recreation class (Wild and Scenic River) stretches of the Thorne River (excluding Thorne Lake), the Forest Road 20 corridor and portions of the West Coast Waterway (north of St. Philip Island).

Sensitivity Level 3 (74.5 percent) is assigned to land areas not seen from any of the level 1 or 2 use areas. This includes much of the Western Peninsula, as well as the Logjam Creek, Rio Roberts, and Rio Beaver drainages.

Visual Quality Objectives

Adopted VQO's are a set of measurable goals for the management of visual resources within the Forest. They are based on a variety of physical and sociological parameters (see Table 3-53) and describe different degrees of acceptable alteration to the natural landscape. VQO's are Preservation, Retention, Partial Retention, Modification, and Maximum Modification (see *Key Terms* section for definitions).

Figure 3-36
Sensitivity Levels in the Control Lake Project Area

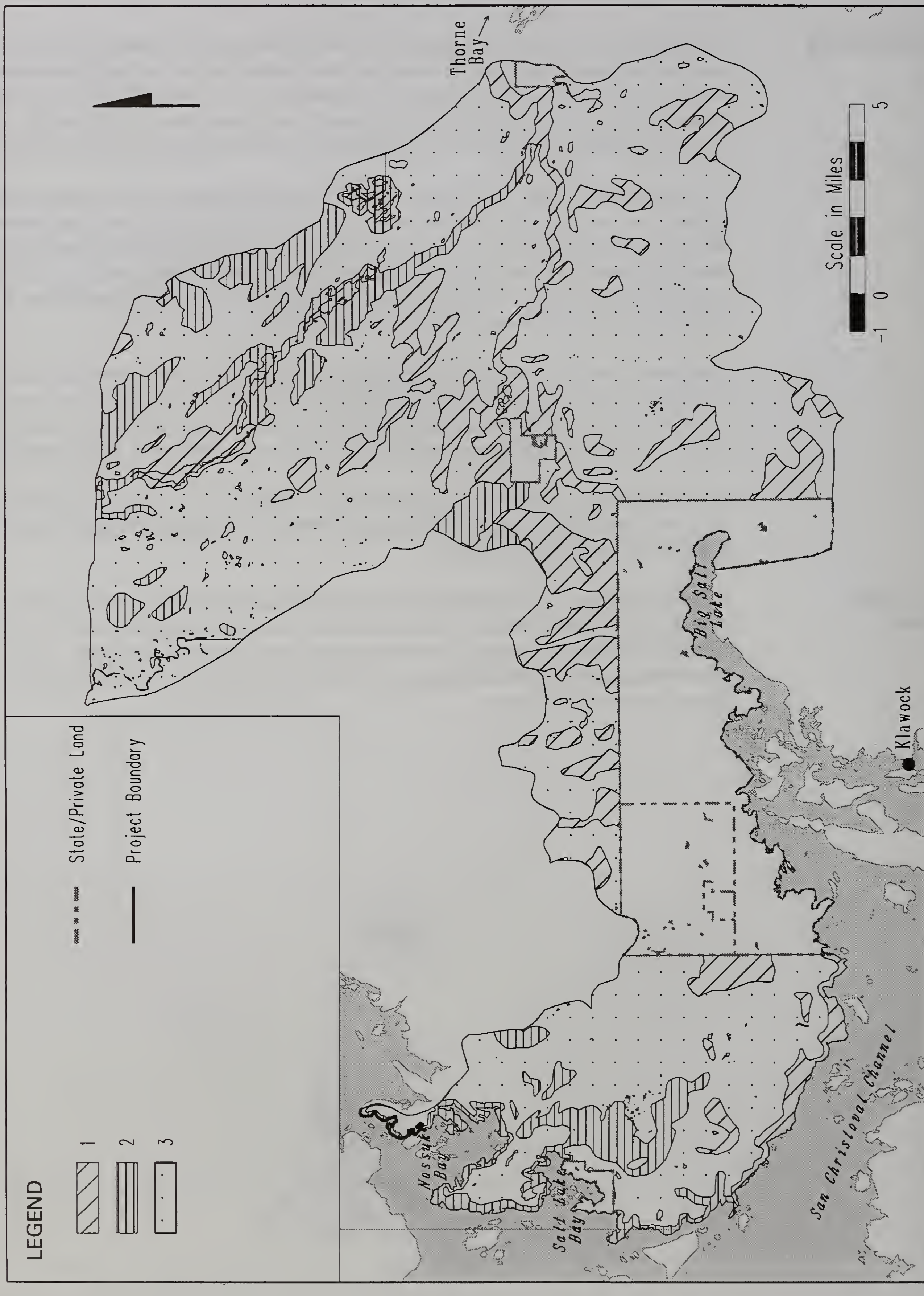


Table 3-53
Adopted Visual Quality Objectives for each Land Use Designation

LUD(s)	Distance Zone Foreground	Middleground	Background	Not Seen
Research Natural Area	Retention VQO	Retention VQO	Retention VQO	Retention VQO
Semi-Remote Recreation	Partial Retention VQO	Partial Retention VQO	Partial Retention VQO	Partial Retention VQO
Scenic River	Retention VQO	Partial Retention VQO	Partial Retention VQO	Partial Retention VQO
Recreation River	Partial Retention VQO	Partial Retention VQO	Partial Retention VQO	Partial Retention VQO
Scenic Viewshed	Retention VQO	Partial Retention VQO	Partial Retention VQO	Maximum Mod-ification VQO
Modified Landscape	Partial	Modification	Modification	Maximum Mod-
Timber Production	Modification	Maximum Modification VQO	Maximum Modification VQO	Maximum Mod-ification VQO
Old-Growth Habitat	Retention VQO	Retention VQO	Retention VQO	Retention VQO

Figure 3-37 depicts Project Area VQO's. While Maximum Modification encompasses much (44.6 percent) of the area on National Forest System lands, significant portions of the Project are within Modification (5.8 percent), Partial Retention (15.3 percent), and Retention (38.6 percent). Foreground views from Cutthroat Lakes and middleground views from Control Lake/Balls Lake are within Partial Retention. All lands in the Semi-Remote Recreation LUD, which abuts the West Coast Waterway, are also within Partial Retention. Foreground and most middleground areas visible from the Scenic River portion of the Thorne River are within the Retention VQO. All lands in the Old-growth Habitat LUD, foreground views from Control Lake, and foreground views from Balls Lake are also within Retention. Areas seen from the Forest Highway #9 range from Retention to Partial Retention in the foreground and from Retention to Modification in the middleground.

Existing and Future Visual Conditions

EVC is a measurement of visual quality and visual effects of current management activities. EVC types range from natural (Type 1), where only ecological changes have occurred, to drastically altered (Type 6), where human-caused changes are in "glaring contrast" to the landscape's natural appearance. EVC Types 1 through 5 correspond to VQO's and may be defined as follows:

Figure 3-37
Visual Quality Objectives in the Control Lake Project Area

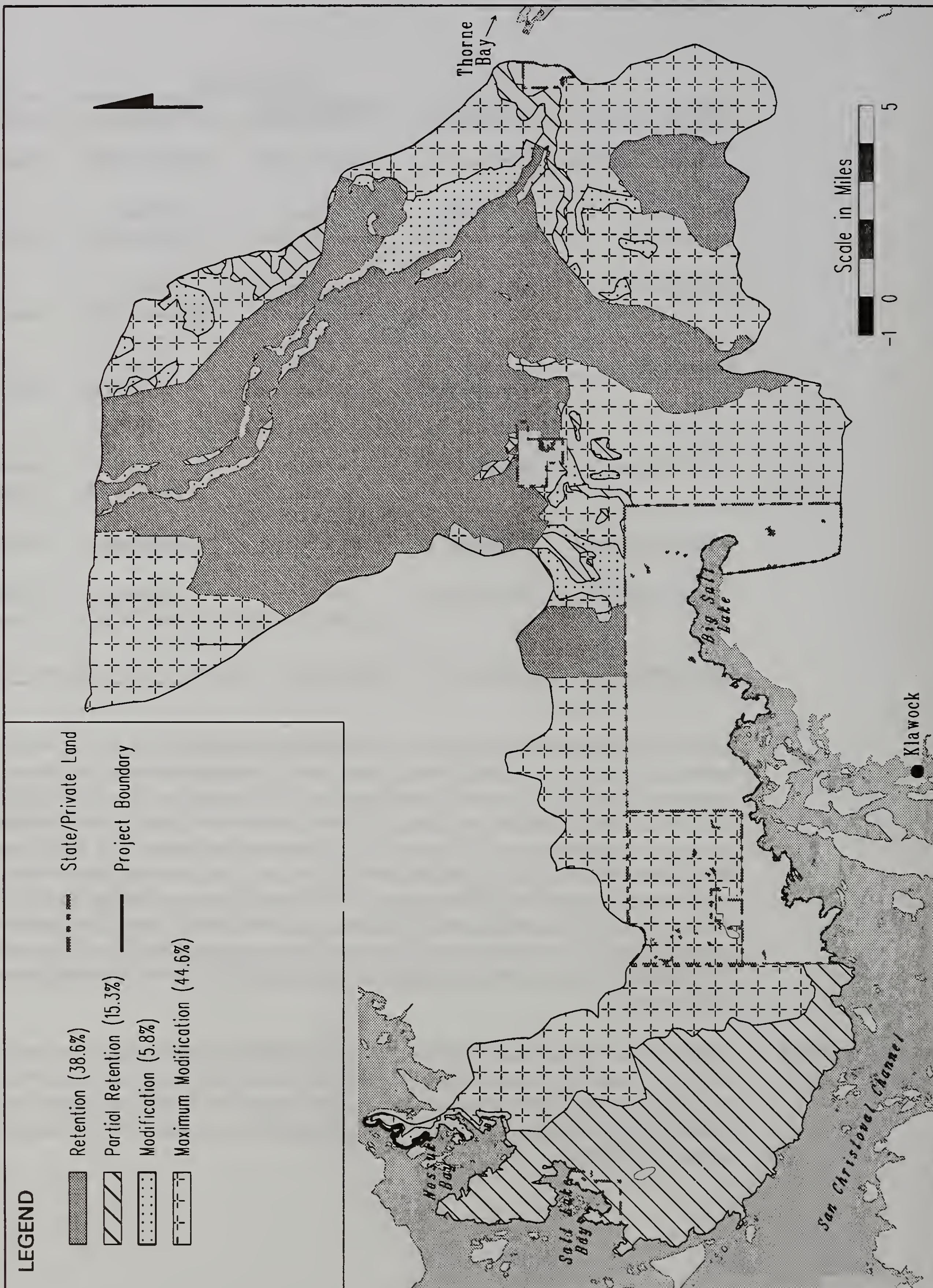
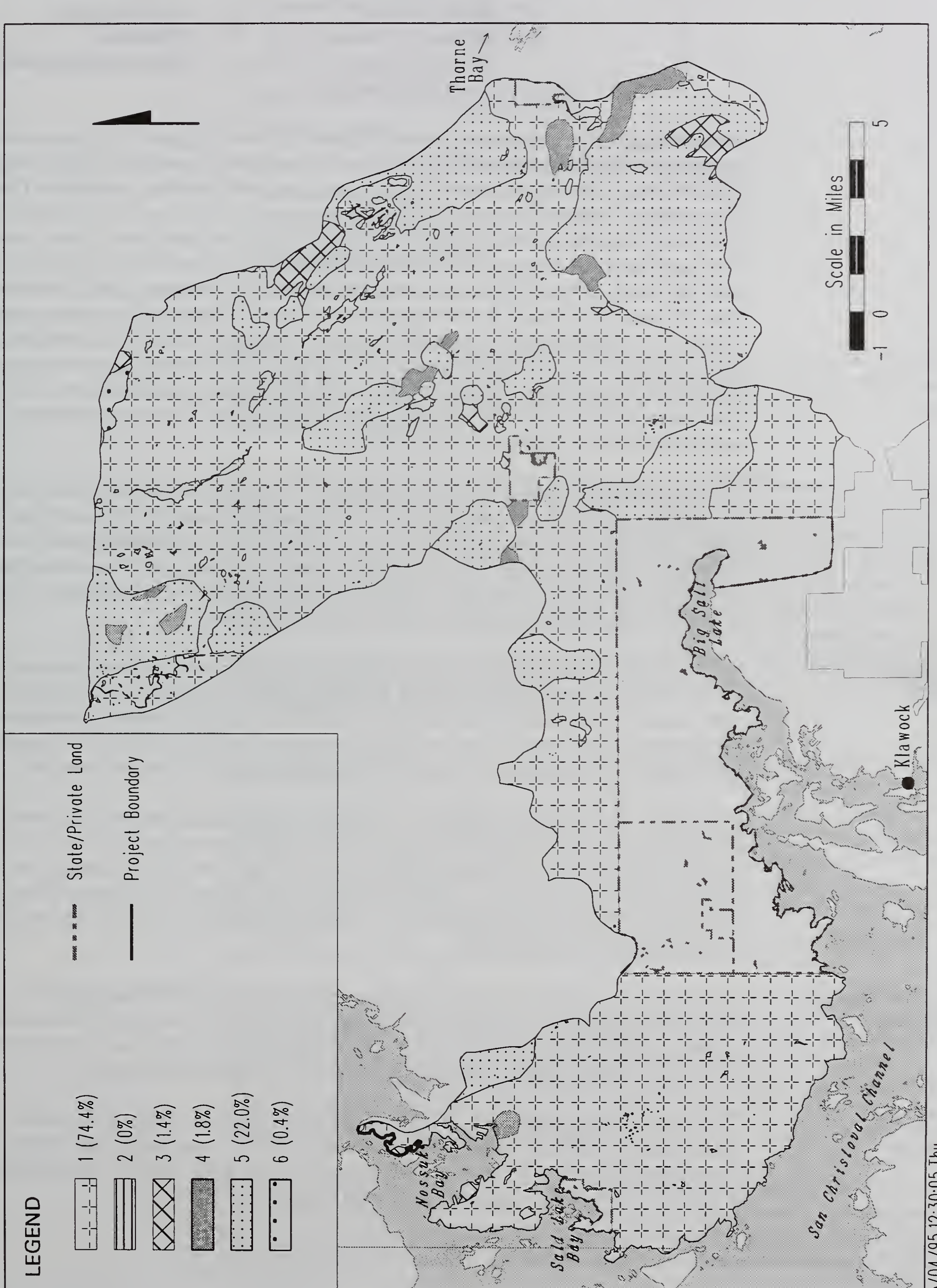


Figure 3-38
Existing Visual Conditions in the Control Lake Project Area



EVC Type	Visual Condition	Corresponding VQO
1	Natural	Preservation
2	Natural Appearing	Retention
3	Slightly Altered	Partial Retention
4	Moderately Altered	Modification
5	Heavily Altered	Maximum Modification
6	Drastically Altered	---

The percentage of the Project Area in each EVC type is shown in Figure 3-38. Large tracts appearing devoid of human activities (EVC Type 1) are presently associated with the Kogish Roadless Area in the western portion of the Project Area, Salt Lake Bay, much of the Thorne River drainage, and other locations in the southeast portion of the Control Lake Project Area. EVC Type 1 accounts for 74.4 percent of the Project Area on National Forest System lands. Heavy and excessive alteration (EVC 5 and 6, respectively) is currently seen on privately owned lands that surround Big Salt Lake adjacent to the Project Area boundary, lands south and west of the Community of Thorne Bay, along the eastern shore of Cutthroat Lakes, surrounding Logjam Creek, areas adjacent to Snakey Lakes, isolated areas near Control Lake and Balls Lake, and other small portions of the Project Area. EVC Types 5 and 6 make up 22.0 and 0.4 percent, respectively, of the Project Area on National Forest System lands. The remainder (3.2 percent) of the area is slightly altered (EVC 3) to moderately altered (EVC 4). None of the Project Area has been classified as natural appearing (EVC 2).

The Future Visual Condition (FVC) represents the visual condition level that would occur at the end of a proposed activity period. Like EVC, it is measured in terms of Condition Types 1 to 6. When compared to EVC, the FVC serves: (1) to analyze the current management situation, (2) to estimate the effect of alternatives, (3) to facilitate visual monitoring, and (4) as a historical record of the degree and amount of physical alteration of the landscape over time and space. The FVC created by each proposed alternative will be analyzed in Chapter 4.

Visual Absorption Capability

VAC is defined by the Forest Service as the ability of the landscape to absorb management activities, such as timber harvest, without its visual character being significantly affected. In other words, VAC helps determine how easy (or difficult) it will be to achieve the Adopted VQO. The landscape slope, variety class, and distance zones are analyzed. When these parameters are overlayed with one another, areas of high, intermediate, and low VAC are identified.

Steep slopes, lack of visual variety, and proximity to areas of high visual sensitivity make several areas of the Project Area's landscape unable to easily absorb management activities (they exhibit low VAC). These areas, which total 8.3 percent of the Project acreage, include much of the West Coast Waterway shoreline, Control Lake, Balls Lake, Cutthroat Lakes, and the Thorne River. Much of the Project Area (77.7 percent) exhibits high VAC, with the remainder (14.0 percent) being medium VAC.

Cumulative Visual Disturbance

Adopted VQO's and VAC levels are combined by the Forest Service to establish guidelines for timber harvest planning. Cumulative Visual Disturbance (CVD), which suggests the maximum allowable percentage of a viewshed (or portion thereof) to be in a disturbed condition at any one time, has been addressed as part of the Control Lake Project planning effort.

Project Area Viewsheds

Viewsheds consist of landscapes seen from a specific viewpoint or series of viewpoints. To assess the potential effects of land management activities the Forest Service has identified Visual Priority Priority Travel Routes and Use Areas (1997 TLMP). Visual Priority Priority Travel Routes and Use Areas of concern to the Control Lake project include:

- Maurelle Islands Wilderness
- West Coast Waterway
- Communities of Craig and Klawock
- Waters around Craig and Klawock
- Control Lake Cabin Site
- Eagle's Nest Campground (Balls Lake)
- Cutthroat Lakes
- Thorne River/Honker Divide Canoe Route
- Thorne River Bridge
- Gravelly Creek Day Use Area
- Community of Thorne Bay
- Forest Highway #9

Figure 3-39 depicts these visual priority areas. For each priority travel route and use area viewshed, scenic quality, distance zone, EVC, and compliance with adopted VQO's are described below. Viewsheds that are significantly affected by the project alternatives are graphically portrayed in Chapter 4.

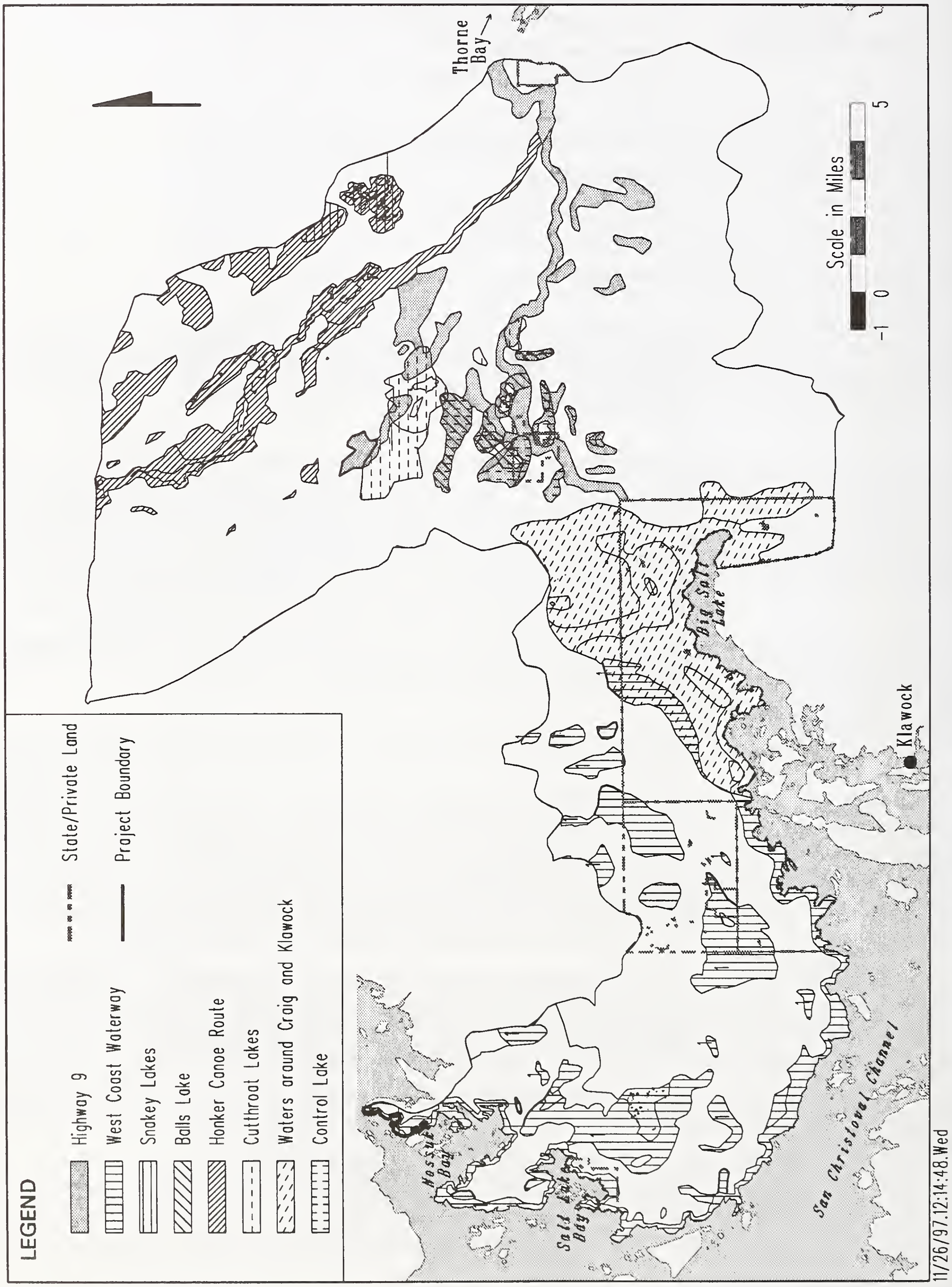
Maurelle Islands Wilderness—This 5,000 acre designated Wilderness Area is comprised of a series of small islands and associated waterways. The area is separated from the Control Lake Project by the Gulf of Esquibel. Views from Anguilla Island, Esquibel Island, and waters inside the Wilderness boundaries incorporate landforms in the western portion of the Project Area (Semi-Remote Recreation and Timber Production LUD's) as background elements. At this distance, the landscape appears as a series of undulating and overlapping horizontal ridgelines. Texture is indiscernible in this area of uniform tree cover. Visible portions of the Control Lake Project Area are of average (Variety Class B) and low (Variety Class C) scenic quality. No human-caused disturbance is evident and the areas appear natural (EVC 1). Adopted VQO's range from Partial Retention to Modification.

West Coast Waterway—This small boat route runs for more than 100 miles along the west side of Prince of Wales Island from Calder Bay in the north to Kaigani Strait in the south. Adjacent to the Control Lake Project Area, it makes use of Tonowek Bay, the Gulf of Esquibel, and San Christoval Channel. Anchorages exist at Nossuk Bay (described later), Salt Lake Bay (also described later), and near St. Philip Island. A potential dispersed campsite, identified by the Forest Service, exists along the Prince of Wales coast northwest of Rosary Island. The Project Area appears as gently to steeply sloping knobs and ridgelines. Areas visible in the middleground are continuously forested, with texture characterized by tree massings. Background slopes are more irregular in form and display little or no texture.

Areas north of Blanquizal Island are of average (Variety Class B) scenic quality, while areas to the south are of low (Variety Class C) scenic quality. South of Nossuk Bay and west of Sombrero Island, visible project lands are in the Semi-Remote Recreation LUD and have a Partial Retention VQO. Visible lands east of Sombrero Island and along the east shore of Nossuk Bay are in the Timber Production LUD. Here, the VQO's range from Modification to Maximum Modification. The present visual condition of the this coastline is natural (EVC 1).

Adjacent to the West Coast Waterway small boat route in the northwest portion of the Project Area is Nossuk Bay. Three existing anchorages and a moorage buoy provide shelter for boaters. Nossuk Bay users may obtain foreground and middleground views of portions of the Project Area that are in the Semi-Remote Recreation and Timber Production LUD. The entire

Figure 3-39
Visual Priority Area Viewsheds in the Control Lake Project Area



area surrounding the Bay is of average (Variety Class B) scenic quality. Partial Retention, Modification, and Maximum Modification VQO's have been adopted. Past harvest activity is evident along the south shore of the Bay in the foreground and at the head of the Bay in the middleground. The visual condition ranges from natural (EVC 1) to moderately altered (EVC 4).

Salt Lake Bay is adjacent to the West Coast Waterway and south of Nossuk Bay. Two existing anchorages provide shelter for users of the small boat route. A potential recreation shelter location has also been identified near the north entrance to the Bay. The State of Alaska has proposed the selection of 917 acres at Salt Lake Bay for a prospective community. Settlement is expected because of the area's access to commercial fishing grounds, growth in commercial recreation, and proximity to timber harvest areas and to the city of Craig. Salt Lake Bay is used extensively by Craig and Klawock residents for community recreation. From the Bay, which is surrounded by a Semi-Remote Recreation LUD, views incorporate continuously forested lands with average (Variety Class B) scenic quality. A Partial Retention VQO has been adopted for this land, which may be characterized as natural (EVC 1).

Communities of Craig and Klawock—The community of Klawock is immediately south of the Project Area on the west coast of Prince of Wales Island. Five miles south of Klawock is the City of Craig. Extensive timber harvest has occurred on privately owned land adjacent to the community and along the perimeter of Big Salt Lake.

Because Craig and Klawock are well outside the boundaries of the Control Lake Project, proposed management activities would have no direct visual impact. However, residents and visitors to these communities often travel through and recreate within the Project Area. Any visual impact on priority travel routes and use areas will, therefore, be felt indirectly within Craig and Klawock.

Waters around Craig and Klawock—San Alberto Bay, Shinaku Inlet, Klawock Inlet, and Big Salt Lake are near the communities of Craig and Klawock. Lands immediately adjacent to the waterbodies are outside the Control Lake Project boundaries and are privately owned. Portions of the Project Area are visible in the middleground distance zones north of Big Salt Lake. These lands are in the Timber Production, Modified Landscape Scenic Viewshed, and Old-growth LUD's. VQO's of Retention, Partial Retention, Modification, and Maximum Modification have been adopted for these National Forest System lands. They are of average scenic quality (Variety Class B) and natural visual condition (EVC 1).

Privately owned land in the foreground distance zone has been extensively harvested. A small amount of logging is also visible on Forest System lands in the Middleground. San Alberto Bay, Shinaku Inlet, and Klawock Inlet receive heavy recreational use by residents of Craig and Klawock. Two existing recreation sites exist along the shoreline of Klawock Inlet, just south of the community bearing the same name. Big Salt Lake receives little recreational use. A boat ramp, accessible via State Highway 929, exists near the head of Big Salt Lake. It is maintained by the State of Alaska. Because they are non-Forest System lands, no LUD's, VQO's, or EVC types have been prescribed for the shores of San Alberto Bay, Shinaku Inlet, Klawock Inlet, or Big Salt Lake. However, it should be noted that the size and extent of the previous harvest is poorly related to the natural landscape. In addition, logging roads have failed throughout the seen area. Because the continually moving soils prevent revegetation, erosion will be apparent for an extended period of time.

Control Lake Cabin Site—This recreation area is about 20 miles west of Thorne Bay and 18 miles northeast of Klawock. A Forest Service skiff and dock along the west shore of the lake is easily accessed from the Forest Highway #9. It provides transportation to and from the cabin on the lake's north shore. En route, panoramic views of the Thorne Mountains are available to

those looking north. Similarly, the Klawock Mountains are visible to the south. Views from the cabin are oriented south across Control Lake and punctuated by the snow-capped peaks around Black Bear Lake (outside the Project Area) in the background. In the foreground distance zone that surrounds the lake the landscape is fairly flat, continuously wooded, and coarsely textured by individual tree boughs. Middleground areas are also continuously wooded. However, these areas are more steeply sloped and display a finer texture created by tree massings.

The State of Alaska previously made a land selection for community development at the main road junction. This selection has been expanded to include land for commercial development, public facilities, and community recreation. Pleasant views, sportfishing opportunities, and the cabin make this an important recreation site for the communities of Thorne Bay, Craig, and Klawock.

The Thorne Mountains, which are visible north of the lake, are highly scenic (Variety Class A), while the remainder of lands visible are of average (Variety Class B) scenic quality. It is the intent of the Forest Service to include all lands visible from the lake and cabin in a Scenic Viewshed LUD. As a result, the Retention and Partial Retention VQO's have been adopted. While automobiles can be heard traveling along Forest Highway #9, which parallels the Lake's western and northern shore, the roadway is screened from view. As seen in planimetric view (see Key Terms) small, heavily altered (EVC 5) areas exist in the middleground to the east and west of Control Lake. However, as seen in perspective view (see *Key Terms*) these areas meet the adopted Partial Retention VQO. The remainder of the visible area is natural (EVC 1) and complies with adopted VQO's.

Eagle's Nest Campground (Balls Lake)—This developed recreation facility is accessible from Forest Highway #9, approximately 18 miles west of Thorne Bay and two miles east of the Control Lake junction. The site is also near the communities of Craig (25 miles) and Klawock (20 miles). The campground is nestled along the shore of Balls Lake in the foothills of the Thorne Mountains. There are eleven camp units, vault toilets, and potable water. The area has been deemed wheelchair accessible. In addition to camping, Eagle's Nest provides a boat launch and boardwalk that now parallels the lake shoreline for 1,800 feet. This boardwalk is to be extended in the near future.

Expansive views of the Thorne Mountains and surrounding foothills are available from the campground, boardwalk, and lake. Scenic quality is high (Variety Class A) to the north, west, and east of the lake. The foreground distance zone surrounding the lake is continuously forested and dominated by the texture of individual trees. Steeply sloped and heavily dissected landforms dominate the middleground, which is also continuously forested. Middleground slopes visible south of the lake are more uniform in appearance and of average (Variety Class B) scenic quality. It is the intent of the Forest Service to include all land visible from the campground, boardwalk, and lake in a Scenic Viewshed LUD. As a result, the Retention and Partial Retention VQO's have been adopted. The vast majority of the seen area is natural (EVC 1). As seen in planimetric view, a small portion of land east of the lake in the middleground is heavily altered (EVC 5). However, as seen in perspective view, this past harvest activity is subordinate to the characteristic landscape and meets its adopted Partial Retention VQO.

Cutthroat Lakes—This recreation site, which comprises two adjacent lakes, is about two miles north of Balls Lake. Recent harvest activity has provided road access to the east side of the area. A recreation shelter is planned for the east side of the lower lake.

The lakes lie at the dividing line between two distinct scenic quality types. To the south and west are the very steep and dissected landforms of the Thorne Mountains, which are high (Variety Class A) in scenic quality. To the north and east is the more rolling terrain of the

Thorne River drainage. It is of average (Variety Class B) scenic quality. All areas seen from the Cutthroat Lakes are in the Old-growth LUD and, therefore, have a VQO of Retention. As mentioned, recent timber harvests have taken place east of the lower lake. As seen in planimetric view, this portion of the seen area is in a heavily altered (EVC 5) visual condition. As seen in perspective, where vegetation along the water's edge screens portions of this harvest activity, the area achieves a Modification VQO. The remainder of the seen area is natural (EVC 1) and meets the adopted Retention VQO.

Thorne River/Honker Divide Canoe Route—Abundant recreational opportunities make this lake-stream system, which lies in the eastern portion of the Project, a use area of local and regional importance. Part of a moderately used saltwater-to-saltwater canoe route between Thorne Bay and Coffman Cove, the Project Area includes the following components of the Honker Divide Canoe Route: Butterfly Lake, Lake Galea, Twin Lake, Thorne Lake, and Snakey Lakes. An existing recreation cabin at Lake Galea provides a convenient layover for canoeists. Potential recreation shelter locations have been identified on the Thorne River near Cutthroat Creek, the island in upper Thorne Lake, and the east shore of lower Twin Lake. A potential dispersed campsite has also been located at the north end of Butterfly Lake, just outside the Project Area. Associated with the Honker Canoe Route are camping, fishing, and wildlife viewing under primitive conditions in a natural-appearing environment.

Much of the Thorne River corridor is of average scenic quality (Variety Class B) and within the Scenic River LUD. The area nearest Thorne Bay is in the Recreation River LUD. Retention and Partial Retention VQO's apply to all seen areas within these two LUD's.

Shorelines and ridgelines give the landscape a horizontal orientation, although strong vertical lines are seen in foreground tree trunks. The gray-green of the spruce-hemlock forest is the dominant color. It is punctuated by the dark blues of the lakes and yellow-greens of herbaceous cover. Texture is the dominant element in this landscape. The homogenous vegetation provides a coarse texture that diminishes with distance. The existing visual condition of landscapes seen from the River and associated waterbodies within the Project Area is predominantly unroaded and natural (EVC 1). Portions of the Butterfly Lake viewshed north of the Project Area have been heavily altered. A small area of recent logging is visible southeast of Twin Lake and northeast of Thorne Lake in the middleground. As seen in planimetric view, this area is heavily disturbed (EVC 5). One recently harvested unit is also visible to the southwest of Lake Galea in the middleground. As seen in perspective view, existing harvest activities within the Project Area portion of the Thorne River corridor are minor disturbances. However, they do not meet the adopted Retention VQO.

Aerial view of Lake Galea looking north

Snakey Lakes includes a portion of the North Thorne River, which meanders through mature timber and muskegs in a serpentine fashion. In places, the stream broadens to form small lakes. The variety of landform, waterform, and vegetation give the Snakey Lakes a high (Variety Class A) scenic quality. While large volumes of timber have been harvested adjacent to the Snakey Lakes and the area is encircled by roads (EVC 5), little of this development is visible from the waterbodies themselves, due to the flat slopes and screening vegetation. The vast majority of seen areas are in a natural (EVC 1) condition and comply with the adopted Retention VQO. All areas seen from Snakey Lakes are in the Scenic River, Old-growth, and Scenic Viewshed LUD's.

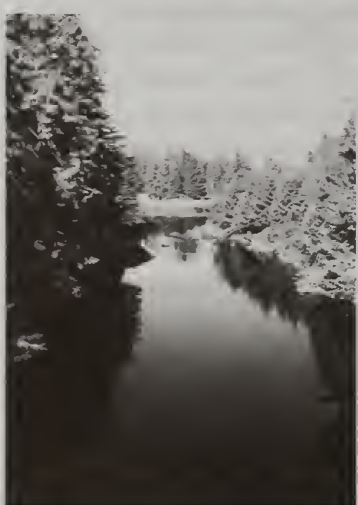
Thorne River Bridge—This popular fishing spot is located where Forest Highway #9 crosses the Thorne River, about six miles west of Thorne Bay. No developed recreation facilities exist. Views are comprised of land in the Recreation River LUD and are restricted by mature vegetation lining the river in the foreground and near-middleground distance zone. Scenic quality is average (Variety Class B). While the bridge itself slightly alters the characteristic landscape

(EVC 3), views upstream and downstream are natural (EVC 1). Adopted VQO's range from Partial Retention to Modification.

Gravelly Creek Day Use Area—This developed recreation area is located on gently sloping terrain, three miles west of Thorne Bay on Forest Highway #9. A picnic shelter, parking area, picnic tables, fire rings, outhouse, and short trail are provided. This popular site faces the Thorne River and is utilized by local residents, as well as tourists. Views are oriented south and entirely foreground in nature. Mature spruce, hemlock, and cedar in the river corridor give the area coarse texture and block views of the surrounding landscape in the eligible Recreation LUD. Scenic quality is average (Variety Class B). While the recreation facilities slightly alter the characteristic landscape (EVC 3), the surrounding areas appear natural (EVC 1). The adopted VQO is Partial Retention.

Community of Thorne Bay—Established in 1962 when Ketchikan Pulp moved its main logging camp from Hollis, Thorne Bay is located outside the Project Area on the east coast of Prince of Wales Island. It has evolved from a company-owned logging camp into an incorporated community. The Project Area is not visible from the community. However, residents and visitors travel through and recreate within the Project Area. Therefore, any visual impact to Priority Travel Routes and Use Areas will be felt indirectly in Thorne Bay.

Forest Highway #9 Corridor—Forest Highway #9 runs from Klawock to the Control Lake junction, and from the junction to Thorne Bay. This viewshed overlaps with several of the Priority Travel Routes and Use Areas described above. Scenic quality is average in areas immediately adjacent to the highway. In some areas, extensive middleground views of the project area are available. The highway traverses the Old Growth, Scenic Viewshed, Modified Landscape, and Recreation River LUD's. All suitable timber harvest lands visible from the highway are intended for inclusion in the Modified Landscape LUD.



Thorne River looking North from Forest Highway #9 bridge

Between Klawock and a point approximately 3 miles south of the Control Lake junction, the corridor is dominated by privately-owned timberlands. Timber harvest activity is evident in many foreground and middleground views. Partial Retention and Modification VQO's have been adopted for National Forest System lands within the middleground distance zones in this area. Foreground seen areas have the Partial Retention VQO.

In the vicinity of the Control Lake junction, the corridor provides views of the Thorne and Klawock mountains to the north and south, respectively. Foreground and middleground distance zones are continuously wooded. State selected land located at the junction is presently undeveloped, but is reserved for possible future community development. Retention, Partial Retention, and Modification VQO's have been adopted.

From the Control Lake intersection east to Thorne Bay, the corridor passes through predominantly natural areas in the foreground and middleground distance zones. The seen area varies from mature forest to open muskegs, and includes views of the Thorne River, several smaller rivers and streams, and the drumlins of the Thorne River corridor. Adopted VQO's range from Retention to Modification.

Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas

Key Terms

Developed recreation—that type of recreation that occurs where more facilities and amenities are incorporated into a site to accommodate intensive recreation activities in a defined area.
Dispersed recreation—that type of recreation use that requires few, if any, improvements or specific developed sites, and may occur over a wide area. This type of recreation involves activities related to roads, trails, and undeveloped waterways and beaches.
Recreation Opportunity Spectrum (ROS)—a system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs.
Recreation place—an identified geographic area having one or more physical characteristics that are particularly attractive to people engaging in recreation activities; can contain from zero to several recreation sites.
Recreation site—specific location or site where recreational activities occur and/or a recreational facility is located; smaller in area than a recreation place.
Recreation Visitor Day (RVD)—a measure of recreation use of an area. One recreation visitor day consists of recreation use of a site or area by one person for 12 hours; can be abbreviated as "visitor day."
Roadless area—an area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.
Service Day—a day or any part of a day for each individual or client accompanied or provided services, including transportation services, by an outfitter or guide.
Wild and Scenic River—rivers or sections of rivers designated by congressional action under the 1968 Wild and Scenic Rivers Act or by an act of the Legislature of the state or states through which they flow.
Wilderness—areas designated by congressional action under the 1964 Wilderness Act or by TTRA and/or ANILCA; undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation.

Introduction

Prince of Wales Island plays an important role in Southeast Alaska by providing settings for various types of outdoor recreation—viewing scenery, boating, fishing, hunting, and hiking. Timber harvest has opened between 1,000 and 1,200 miles of road throughout the island to the general public. This high degree of accessibility creates many opportunities for roaded recreational activities and sets the island apart from most other areas of Southeast Alaska.
Limited timber harvest has occurred in the Control Lake Project Area, making it less accessible by road than other parts of the island. State Highway 929 enters the Project Area from Klawock and intersects with Forest Roads 20 and 30 near Control Lake. Forest Road 30 provides access to Thorne Bay and several popular recreation sites such as Control Lake, Eagle's Nest Campground, and the Thorne River. Other forest roads, such as Forest Road 3015 and a number of newer roads, provide access to parts of the Project Area.

Most of Prince of Wales Island is contained in two Forest Service ranger districts within the Ketchikan Area of the Tongass National Forest. The Craig and Thorne Bay Ranger Districts contain virtually all of the island's public recreational facilities, including over 20 recreation cabins and shelters, one developed campground, dispersed camping areas and several developed day use/picnic areas, and approximately 20 miles of maintained trails. The Project Area is located in the Thorne Bay Ranger District in central Prince of Wales Island.

Recreation Opportunity Spectrum

The Forest Service developed the ROS system to help identify, quantify, and describe the variety of recreation settings available in National Forests. The ROS system provides a framework for planning and managing recreation resources. The ROS settings are classified using a scale ranging from primitive to urban. Seven elements are used to determine where the setting belongs on the scale:

- **Visual Quality**—the degree of apparent modification of the natural landscape.
- **Access**—the mode by which activities are pursued and how well users can travel to or within the setting.
- **Remoteness**—the perceived separation of the setting from evidence of other human activity or structures.
- **Visitor Management**—the degree and appropriateness of how visitor actions are managed and serviced.
- **On-site Recreation Development**—the degree and appropriateness of recreation facilities provided within the setting.
- **Social Encounters**—the degree of solitude or social opportunities provided.
- **Visitor Impacts**—the degree of impact on both the attributes of the setting and other visitors within the setting.

Based on these seven elements, the Forest Service assigns one of six ROS settings zones to all Forest Service land. Five of the settings are found in the Project Area and are described below.

Primitive: An essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. Motorized use is generally not permitted.

Semi-Primitive Nonmotorized: A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed.

Semi-Primitive Motorized: A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. Local roads used for other resource management activities may be present.

Roaded Natural: A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.

Roaded Modified: A natural environment substantially modified particularly by vegetation and landform alterations. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.

Project Area ROS

This EIS assumes that all the proposed harvest units in the 1989-1994 operating plan were cut. Thus, the description of the existing condition of the recreation resource is based on what the mix of ROS settings would be upon completion of the 1989-1994 timber harvest. Implementation of the Central Prince of Wales project (adjacent to the Control Lake Project) will have very little effect on ROS settings in the Project Area. Most of the Central Prince of Wales harvest units

that will be located near the Project Area boundaries will occur in areas that have been previously harvested and roaded. Many of the new units will be located between old units. As a result, existing ROS settings in the Project Area will not change significantly as a result of harvesting associated with Central Prince of Wales.

The vast majority (85 percent) of the Project Area is included within two ROS settings—Semi-Primitive Nonmotorized (SPNM) and Roaded Modified (RM) (Figures 3-40 and 3-41). The SPNM setting is the most extensive, accounting for 57 percent (97,754 acres) of the total Project Area. There are several distinct areas of SPNM separated by areas of RM (Figure 3-38). These include a large strip in the western section of the Project Area located between the coastal strip of Semi-Primitive Motorized (SPM) and a band of RM, a block on the north edge of the middle section that includes the Shinaku Creek drainage and lakes, and an area that wends its way through much of the eastern portion of the Project Area beginning north of State Route 929 and continuing along the Thorne River past Thorne Lake to Twin Lakes and east and north to the Project Area boundary. This block, constituting almost half of the total SPNM area (approximately 42,000 acres), contains much of the Thorne Mountains and Upper Cutthroat Lake. Other SPMN areas are located south of Control Lake, three areas north of and adjacent to the Karta Wilderness, and a sizable area around upper Steelhead Creek.

The RM class is the second largest in the Project Area (49,205 acres) (Figure 3-38). The areas are generally found where timber management activities have occurred. The largest RM setting (approximately 14,900 acres) is in the southeast corner of the Project Area between Forest Road 20 to the north and the Karta Wilderness to the south. Two RM settings are near Honker Divide. Another large RM setting (12,200 acres) can be found in the western section of the Project Area encompassing an unnamed creek drainage and the Nossuk Creek drainage. Most of the Sealaska land adjacent to the south edge of the central Project Area is classified as RM.

The Project Area contains one contiguous 11,720-acre Primitive setting that surrounds Lake Galea. There has been no timber harvest or road development in the setting.

One Roaded Natural (RN) setting of 6,964 acres exists in the Project Area in the central eastern section. The setting is a narrow (1/2- to 1-mile-wide) strip paralleling the Thorne Bay and Big Salt roads from the eastern edge of the Project Area, past Balls and Control lakes, and southwest approximately 3 miles to the Forest boundary.

There is one SPM setting of approximately 6,267 acres in the Project Area. It is roughly 1/3- to 1 mile wide and runs along the west coast beginning at Nossuk Bay and continues south approximately 15 miles to Elevenmile Creek.

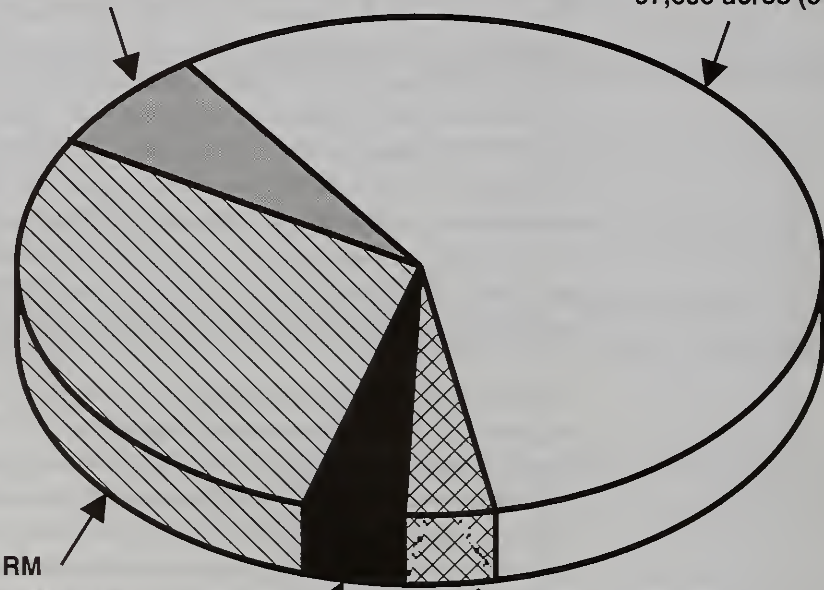
Recreation Places

Recreation Places (RP's) are general areas used for recreation activities. Activities in such places can be concentrated at specific Recreation Sites or dispersed throughout the RP. Because the majority of the Tongass National Forest is undeveloped, it is primarily used for dispersed recreation activities. Viewing scenery and wildlife, boating, fishing, beachcombing, hiking, and hunting are the primary dispersed recreation activities of resident users. Access is key to how outdoor recreation resources are used. RP's easily reached by car have higher visitation rates than those located in remote, roadless areas. Access to recreational resources in the Tongass is typically by boat or by motor vehicle on community or forest roads.

The ROS setting of RP's largely determines their attractiveness and utility. Many recreation opportunities, such as viewing scenery, require a natural type of ROS setting; other activities such as hunting and fishing may not directly depend on the setting. The locations of RP's within the Project Area are illustrated in Figure 3-42. Table 3-54 describes the RP's located in the Project Area.

Figure 3-40

Acreage of ROS Settings in Control Lake Project Area



SOURCE: Forest Service 1992b.

Note:

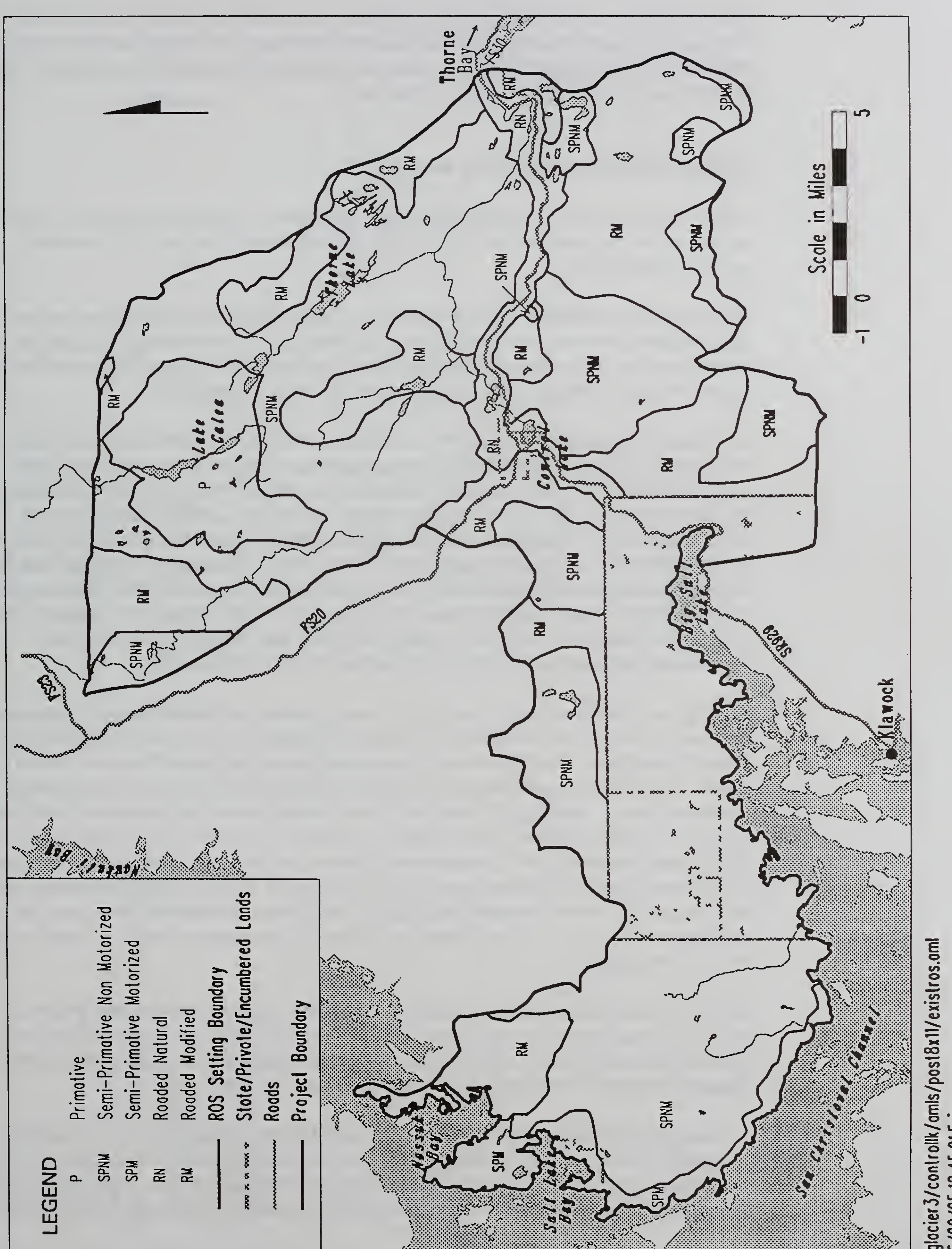
R	=	Roaded
RN	=	Roaded Natural
RM	=	Roaded Modified
SPNM	=	Semi-Primitive Non-Motorized
SPM	=	Semi-Primitive Motorized
P	=	Primitive (unmodified natural environment)

Types of activities that occur in RP's in the Project Area can be grouped into three general categories based on the physical setting required for the activity—freshwater, land-based, and marine.

Freshwater-based Recreation

The abundance of lakes, rivers, and streams on Prince of Wales Island generally, and in the Control Lake Project Area specifically, provides numerous recreational opportunities. The most popular activities with recreationists are those that can be conducted near communities that are accessible by roads, trails, or boats. These activities include fishing, boating, kayaking, wildlife

Figure 3-41
Map of ROS Settings



viewing, and camping. The most sought-after settings at freshwater-related RP's are those that provide opportunities for: (1) getting away (solitude), (2) enjoying natural and scenic settings, (3) fishing for a diversity of species, and (4) good airplane access (USDA Forest Service, 1986).

The Project Area contains more recreation places associated with freshwater-based recreation (18) than with marine-based (5) and land-based (4) combined. Freshwater-based RP's within the Project Area can be broken down into those associated with the Thorne River/Hatchery Creek Corridor, and those located outside the corridor.

Thorne River/Hatchery Creek Waterway

The lower section of the Thorne River is especially popular with anglers and floaters who can access the river via road and put in at 8½ Mile or Goose Creek. The rest of the waterway receives much less use.

The Thorne River/Hatchery Creek Waterway is a significant local and regional recreational resource that is receiving national attention. The corridor is popular among local anglers and boaters because of the rich recreation opportunities offered by the Thorne River and Hatchery Creek. It is also becoming more popular among non-local recreationists.

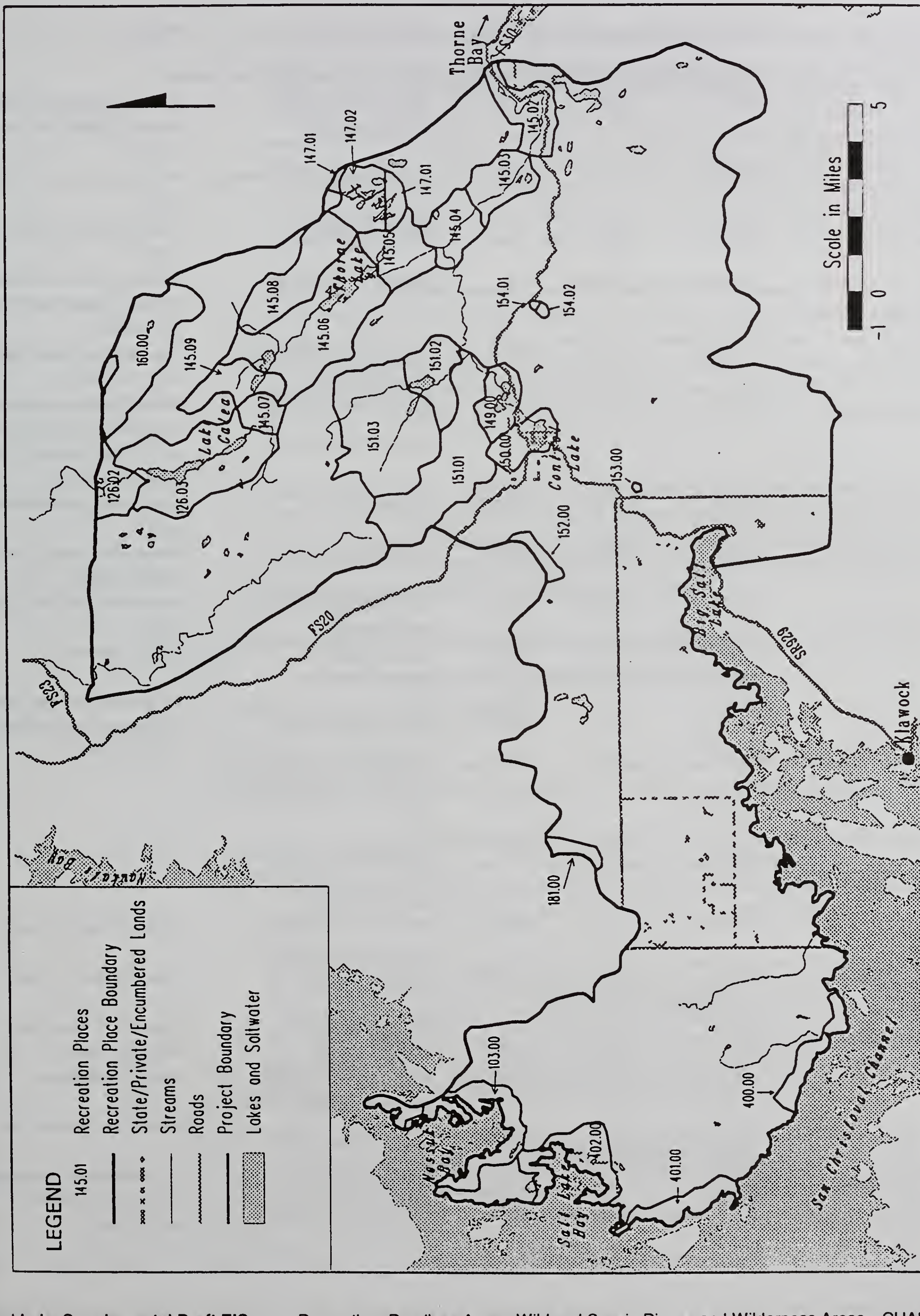
The Thorne River/Hatchery Creek Waterway is part of the largest stream system on Prince of Wales Island. It supports wild fall and spring steelhead, coho, sockeye, and pink salmon; cutthroat and rainbow trout; and Dolly Varden char (Hoffman, 1991). The ADF&G has identified the Thorne River as one of 19 blue-ribbon fishing streams in Southeast Alaska (personal communication, J. Gustafson, area habitat biologist, ADF&G, Ketchikan, Alaska, May 25, 1993). Steelhead fishing is especially popular on the Thorne River. The ADF&G estimated that there were 3,070 steelhead angler-hours spent on the Thorne River during the 1989-1990 season (Greenig, 1995). The popularity of the river is due to the variety of species it supports, fishing success, easy roadside access, and proximity to Thorne Bay. Fifty-five percent of the recreationists surveyed on the river were from Thorne Bay (Hoffman, 1991).

Boating (including motorized fishing boats, canoes, kayaks, and inflatable rafts) is popular on the lower sections of the Thorne River. Canoes and kayaks are used to travel on the Honker Divide Canoe Route. The 30-mile-long canoe route follows the Thorne River and Hatchery Creek. It is one of two such extensive established routes (the other is on Admiralty Island) in Southeast Alaska. Although the Admiralty route is better known, the established road system on Prince of Wales Island and Alaska Marine Highway service to the island make the Honker Divide route more accessible. An estimated 12 parties per year averaging 5 people each have canoed the entire route in recent years. Each trip averages 3 days. Canoeists/kayakers spend an estimated 360 recreation visitor days (equal to 4,320 canoeist/kayaker visitor hours) per year paddling the entire route. An undetermined number of recreationists paddle only parts of the route (Greenig, 1995).

The entire corridor has been divided into a series of RP's based on factors such as type of possible recreational activity, geographic location, and remoteness. RP's and existing and potential Recreation Sites within those places that are found within sections of river corridor located in the Project Area are described below (Figures 3-42 and 3-43).

- **Lower Thorne River (RP's 145.02, 145.03, and 145.04)**—These RP's are located along a section of the river that is wide, relatively deep, and easy to access by boat (Figure 3-42). ROS settings are RN (RP 145.02) and SPNM (RP's 145.03 and 145.04). Timber harvest has occurred in or near part of RP's 245.02 and 245.03, but not RP 145.04. RP 145.02 contains two

Figure 3-42
Recreation Places



/glacier3/controlk/amls/post8x11/recplaces.aml
05/12/94.15:18:22.Thu

Table 3-54
Control Lake Project Area Recreation Places and Sites

Recreation Place	Acres	ROS Class	Activities/Features	NOTES
FRESHWATER BASED RECREATION—Thorne River/Hatchery Creek Corridor				
145.02	1537	RN	Canoe/kayaking, stream fishing, picnicking	Area of confluence of Gravelly and Goose Creeks with Thorne River
145.03	1385	SPNM	Canoe/kayaking, stream fishing	Area of Lower section of Thorne River
145.04	1332	"	Recreation shelter	Thorne River near Cutthroat Creek
145.05	1540	P	Canoe/kayaking, hiking	Area along Thorne River, west of Snakey Lakes, Upper Thorne River portage
145.06	4917	SPNM	Canoe/kayaking, developed camping, fishing	Area including Thorne Lake and Lower Twin Lake
145.07	647	P	Canoe/ kayaking, hiking	Honker Divide (and portage) and area adjacent to Thorne River north of Twin Lake and Lake Galea (Honker Lake)
145.09	1256	P & SPNM	Big game hunting	Upper Twin Lake and ridge to north
126.02	967	SPNM	Canoe/kayaking	Area around Butterfly Lake, on project boundary
126.03	4162	P	Canoe/kayaking, rec. cabin use, power boat use	Area around Lake Galea (Honker Lake)
147.01 & 147.02	1298	SPNM	Canoe/kayaking	Snakey Lakes area
FRESHWATER BASED RECREATION—Outside of Corridor				
154.01	35	RN	Trail	Rio Roberts Creek and trailhead
054.02	63	SPNM	Minor interpretive site	Rio Roberts Creek and trail area
149.00	1085	RN	Viewing scenery, hiking, canoe/ kayaking, lake fishing, developed camping, ice skating, interpretive site	Balls Lake area
150.00	1077	RN	Viewing scenery, lake fishing, rec. cabin use, ice skating, snow/ice play, power boating	Control Lake area
151.02	1477	SPNM	Hiking, big game hunting, camping, canoe/kayaking	Lower Cutthroat Lake area
151.03	4805	SPNM & RM	Big game hunting	Upper Cutthroat Lake area
LAND BASED RECREATION				
145.08	2414	RM	Big game hunting	Ridge east of Thorne Lake
160.00	3010	SPNM	Big game hunting	East of RP 145.08
151.01	4083	SPNM & RN	Hiking, dispersed camping, big game hunting, upland bird hunting	Thorne Mountain area
153.00	31	RM	Observation	Area south of Control Lake
MARINE BASED RECREATION				
400.00	910	SPM	Dispersed camping	Area northwest of Rosary Island
401.00	1023	SPM	Anchorage	Area across channel from Philips Island

existing Recreation Sites—a fishing area at the State Highway 929 bridge over the Thorne River (it is also used by locals for swimming), and the Forest Service-developed Gravelly Creek picnic site near the confluence of the Thorne River with Gravelly Creek. A potential recreation shelter site has been identified near the confluence of Cutthroat Creek.

- **Thorne and Twin Lakes (RP's 145.05, 145.06, 145.07, and 145.09)**—RP 145.05 contains the Upper Thorne Portage which is approximately 2 miles long and goes around Thorne Falls. RP 145.07 contains the divide that separates the Thorne River and Hatchery Creek drainages and includes the 1-mile long Honker Divide Portage (Figure 3-42). There has been no timber harvest or road building in or near any of these RP's. Because of their pristine nature, ROS settings are Primitive (RP's 145.05, 145.07, and 145.09) and SPNM (RP 145.06). The one existing Recreation Site in this segment is a fishing site at the north end of Lower Thorne Lake. Two potential recreation shelter sites have been identified—one at the southern end of an island in Upper Thorne Lake, and another on the east shore of Lower Twin Lake.

- **Lake Galea (Honker Lake) (RP's 126.02 and 126.03)**—These two RP's include Lake Galea, the segment of Hatchery Creek downstream from Lake Galea to Butterfly Lake, and the southern half of Butterfly Lake (the half in the Project Area) (Figure 3-42). Lake Galea is in an essentially pristine area. The only access to the area is by air or river. There has been no timber harvest or road building in either RP. ROS settings are SPNM (P 126.02) and Primative (RP 126.03). The Forest Service's Honker Lake cabin is the only existing recreation site in the two recreation places.

- **Snakey Lakes (RP's 147.01 and 147.02)**—These two RP's are located east of the main Thorne River corridor and encompass the Snakey Lakes area (Figure 3-42). Only a small portion of RP 147.01 is located in the Project Area. ROS settings are RM (RP 147.01) and SPNM (RP 147.02). There are no existing Recreation Sites in either RP, but a potential recreation shelter has been identified in RP 147.01.

See the *Wild and Scenic Rivers* section for a further discussion of the Thorne River.

Other Freshwater-based RP's

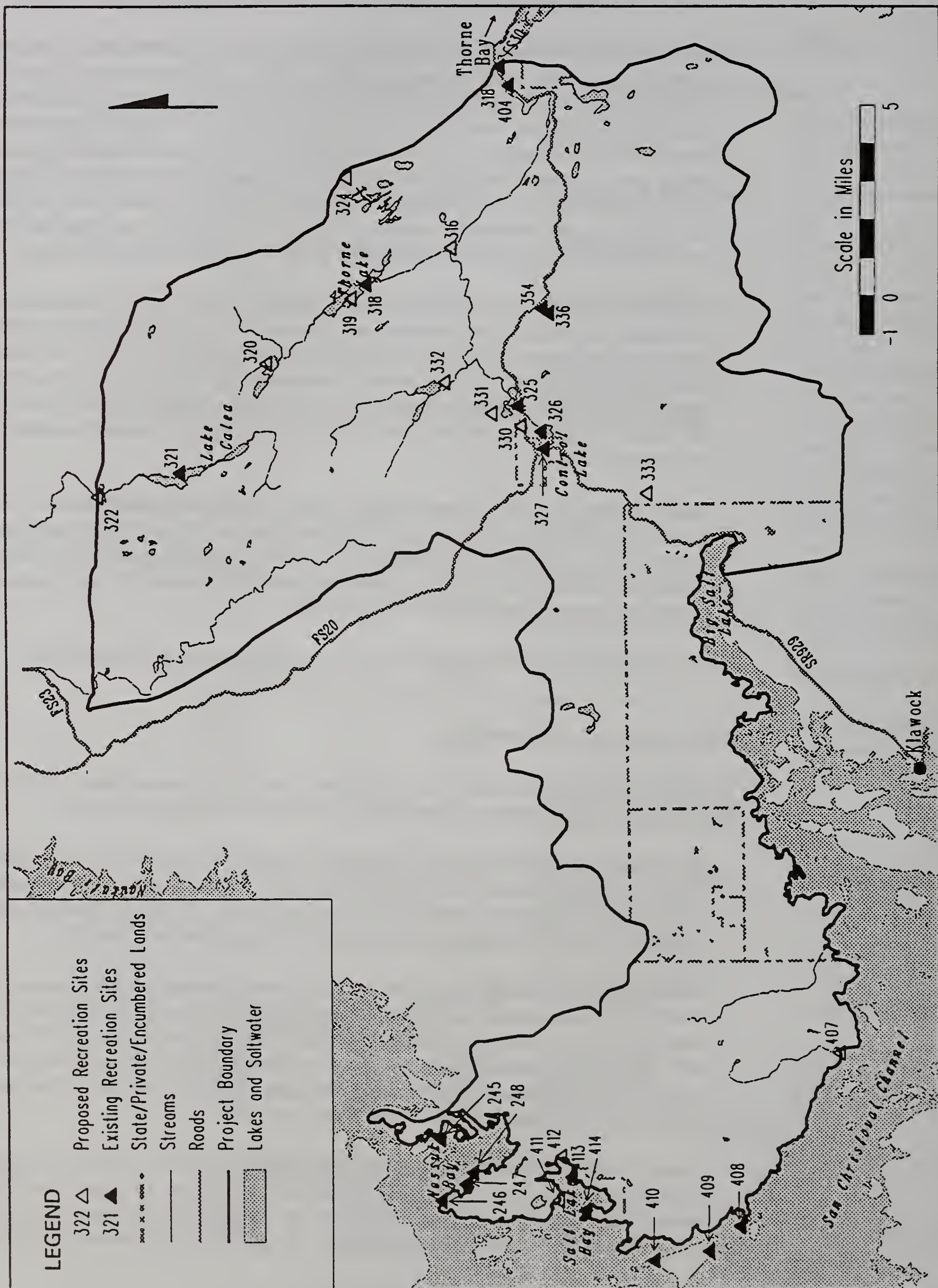
A number of freshwater-based RP's can be found in the Project Area outside of the Thorne River/Hatchery Creek Corridor (Figure 3-42). They are briefly described below.

- **Rio Roberts Creek (RP's 154.01 and 154.02)**—Both RP's include Rio Roberts Creek (Figure 3-42). RP 154.01 is adjacent to State Highway 929 and includes the Rio Roberts trailhead. RP 154.02 is located upstream from RP 154.01 and includes the Rio Roberts trail, fish pass, and fish pass overlook. ROS settings are RN (RP 154.01) and SPNM (RP 154.02).

- **Control Lake (RP 150.00)**—This RP includes Control Lake and its immediate surroundings. The hills and lands around the lake are essentially pristine, although vehicle traffic can be heard and timber harvest is somewhat visible from the lake. The RP is in an ROS setting of RN. There are two existing Recreation Sites—a Forest Service cabin and a Forest Service dock and rowboat primarily used to access the cabin. Part of the west end of the lake and the land around it has been conveyed to the State of Alaska.

- **Balls Lake (Eagle's Nest Campground) (RP 149.00)**—This RP surrounds Balls Lake and includes the Eagle's Nest Campground. Because of the presence of Eagle's Nest Campground, this RP receives more use than most of the other RP's (an estimated 295 recreation visitor days in 1992 at the campground alone). The RP has an ROS setting of RN. Two

Figure 3-43
Recreation Sites



potential Recreation Sites have been identified—the trailhead and trail that would lead to Thorne Mountains. There is also a proposal to add 2.2 miles of trail to the existing 0.5-mile-long trail in order to completely encircle the lake. A day-use site on the lake near the Eagle's Nest Campground is also being planned.

- **Lower Cutthroat Lake (RP 151.02)**—This RP is located in an area surrounding Lower Cutthroat Lake, the lower slopes of Thorne Mountains, and the section of Cutthroat Creek between the lake and it's confluence with Control Creek. Timber harvesting has occurred on the slopes east of Lower Cutthroat Lake and north of the lake, and parts of some harvest units are visible from Lower Cutthroat Lake. Because of harvest activities, this RP has ROS settings of RM and SPNM. There are no existing Recreation Sites, but a potential site for a recreation shelter on the eastern shore of Lower Cutthroat Lake has been identified.

Land-based Recreation

Land-based recreation activities occur widely, but are most prevalent where access is more available. Recreationists use areas such as alpine ridges and mountaintops when trails are available (TLMP, 1976). The most popular land-based recreation activities are hunting, hiking (where there are trails), and driving for pleasure (where there are roads). The principal attributes of these places are good access, remoteness from communities and developed sites, availability of parking sites for recreational vehicles (but without facilities), scenery for viewing, little-used roads to explore, and freedom to choose activities (Clark et al., 1984).

Areas where land-based recreation occurs in the Project Area are somewhat limited compared to those offering opportunities for marine and freshwater recreation. However, the vastness of the undeveloped area creates the perceptions of naturalness and remoteness associated with the more defined marine and freshwater recreation places. Naturalness and remoteness are rated as very important by 80 to 90 percent of the recreation users of the Tongass (Clark and Johnson, 1981).

Land-based RP's in the Project Area generally are located in upland areas, adjacent to or on some of the prominent land forms such as Thorne Mountains. The following describes the four RP's that can accommodate primarily land-based recreational experiences.

- **Ridge East of Thorne Lake (RP 145.08)**—This RP includes much of the ridge east of Thorne Lake (Figure 3-42) and is primarily used for upland big game hunting. Access to the area is by Forest road. The RP ROS setting is RM. There are no existing or potential Recreation Sites.

- **Southern and Western Thorne Mountain (RP 151.01)**—This RP contains much of southern and western Thorne Mountain. The forested southern slopes of Thorne Mountain is visible from Balls and Control lakes and State Highway 929. The ROS settings are SPNM and RM.

- **Upper Cutthroat Lake and Northern and Eastern Thorne Mountain (RP 151.03)**—This RP includes the Upper Cutthroat Lake, it's drainage, and the northern and eastern sections of Thorne Mountain. Upper Cutthroat Lake is only accessible overland or by helicopter. The area is in an ROS setting of SPNM and RM. There are no existing or potential Recreation Sites in the RP.

- **South of Control Lake (RP 153.00)**—This is a small (31-acre) RP (Figure 3-42) that was established as an observation point (to view a scenic waterfall on Steelhead Creek) or area of

scenic interest. The RP has a ROS setting of RM.

Marine-based Recreation

In Southeast Alaska, the family boat is used the way wheeled recreational vehicles are used in other areas. Most marine-based recreation originates in local community boat harbors or launching sites accessed by roads. Typical day-use occurs within a 15- to 30-mile radius (University of Oregon, 1983).

The most popular marine-based activities are beachcombing and hiking, fishing, motorboating, clamming and crabbing. Other popular activities are hunting and kayaking/canoeing. Wildlife viewing is increasing in popularity. A recent survey (Shea, 1990) shows a strong relationship between marine access and wildlife viewing opportunities on the upland areas. The survey indicates that nonhunting wildlife activity, such as wildlife viewing, accessed primarily by boat is one of the fastest growing commercial recreation businesses in Southeast Alaska.

Marine-based recreation occurs mainly along the west coast of the Project Area. Saltwater fishing for salmon and halibut is common offshore of many of the RP's (Figure 3-43). Hunting takes place primarily in the upland areas above some of the RP's, and to a lesser extent along the coast. Users of the West Coast Waterway would likely use facilities in the Project Area such as cabins and shelters when they are built (they are currently identified as potential Recreation Sites).

- **Coast Northwest of Rosary Island (RP 400.00)**—Located across a channel from Rosary Island, this RP is accessible only by sea. It is in an ROS setting of SPM. The adjacent hillsides are pristine. There are no existing Recreation Sites. A potential dispersed camping site has been identified near a beach adjacent to the mouth of a stream.

- **Coast Across Channel from St. Phillips Island (RP 401.00)**—This RP extends along the Prince of Wales Island coast from about 2.5 miles south of St. Phillips Island to approximately 1.5 miles north of it. The hillsides behind the coastline in this RP and on nearby St. Phillips Island are pristine. The three existing anchorages in the RP are located in protected waters sheltered by St. Phillips Island and/or other promontories on Prince of Wales Island. The ROS setting is SPM.

- **Salt Lake Bay (RP 402.00)**—Salt Lake Bay, accessible from the water or air, offers shelter on the Gulf of Esquibel and an interesting coastline for exploration and anchorage. The ROS setting is SPM. Two existing anchorages exist in the bay. Two potential sites have been identified—a recreation shelter near the north entrance to the bay and a family picnic area in the northeast corner of the bay.

- **Nossuk Bay (RP 103.00)**—Nossuk Bay, accessible only by sea or air, offers a number of islands and inlets in which to anchor and to explore. Nossuk Bay has been assigned an ROS of RM and SPM. There are four existing anchorage sites in the bay.

Recreation Sites

Recreation Sites are existing or potential specific locations identified by the Forest Service as having exceptional recreational value. While an RP is a general location where recreational activities potentially occur, a Recreation Site is a specific location within an RP where activities are concentrated. Users of Recreation Sites also recreate in the larger RP. A Recreation Site may: (1) have developed facilities such as a campground or cabin, (2) have potential for such a facility, (3) be an undeveloped use area, or (4) be a natural attraction conducive to specific activities such as anchoring a boat or fishing. Changes in the quality of recreational experiences

at Recreation Sites based upon the seven recreation elements used to describe ROS settings can be used to compare the effects of different management alternatives on recreation.
A survey of Prince of Wales residents in 1991 asked them to prioritize potential Recreation Sites or improvements to existing sites (USDA Forest Service, No Date b). A Forest Service ID Team recommended one potential Recreation Site in the Project Area as having a high priority for development between 1992 and 1997. This projected site would involve extending the existing Eagle's Nest boardwalk around Balls Lake to make a 2.7-mile-loop trail. A day-use site is now being planned in association with the trail extension.

Twenty existing and 16 potential Recreation Sites have been identified in the Project Area (see Figure 3-43). Some of the more significant existing and potential Recreation Sites are described by category below. More extensive information can be obtained from the Forest Service or found in the Control Lake Project Recreation and Lands Resource Report (Greenig, 1994).

Recreation Cabins and Shelters

Forest Service recreation cabins and shelters are available to the public for a fee of $25 per night and are generally located near remote lakes, rivers, streams, or saltwater beaches (USDA Forest Service, 1992b). They are usually accessible only by floatplane, boat, or trail.

Cabins

- **Control Lake Cabin (in RP 150.00)**—Located on the north side of Control Lake, approximately 0.25 miles south of State Highway 929, this cabin is accessed by a Forest Service rowboat at the west end of the lake. An unmaintained trail also connects the cabin to State Highway 929. Cabin log entries show popular activities to be fishing, wildlife viewing, relaxing, and hunting. Guests are mainly from Prince of Wales Island or other Southeast Alaska areas. Cabin use was estimated at 794 recreation visitor days in 1992.

- **Lake Galea Cabin**—This cabin is located on the eastern shore of the upper portion of Lake Galea and is accessible only by canoe/kayak (for people using the Honker Divide canoe route) or floatplane. Popular activities include, fishing, wildlife viewing, relaxing, rowing the boat throughout the lake, and hunting. Guests were mainly from Southeast Alaska areas. A number of entries indicated that the cabin was a stopping point for people using the Honker Divide canoe route. Cabin use was estimated at 134 recreation visitor days in 1992.

Control Lake Cabin

Shelters

Seven potential sites for recreational shelters have been identified in the Project Area (Figure 3-43). Shelters are generally three-sided structures with a roof, fire pit, and bunks. Five of the shelters would be sited along the Thorne River corridor (in RP's 151.02, 145.03, 145.06, and 147.01) and would help complete a series of shelters/cabins/campgrounds for the Honker Divide canoe route. In addition, potential shelter sites have been identified for the south end of Cutthroat Lake (RP 151.02) and near the north entrance to Salt Lake Bay (RP 54411). The Salt Lake Bay shelter would be the only coastal shelter in the Project Area and would be an important addition to the West Coast Waterway.

Anchorage and Boating Sites

Anchorage sites are selected for attributes such as scenery, excellent fishing, and shelter from winds and swells. Designated sites are deep enough to accommodate most recreational boats, yet are close to shore. They can also provide safe moorage during bad weather. There are nine existing anchorages in the Project Area. Four are located in Nossuk Bay, two are in Salt Lake Bay, and the remaining three are in the vicinity of Phillips Island.

Two boat ramps near the Project Area provide saltwater access. The Big Salt Lake ramp, maintained by the State Department of Transportation, is located near the head of Big Salt Lake. The second ramp is located in the city of Klawock near the Klawock River bridge and provides access from Klawock Lake and River to Klawock Inlet.

In addition, the city docks at Craig and Klawock provide public marine access.

Campgrounds

There is currently one existing developed campground in the Project Area. The Eagle's Nest Campground is approximately 18 miles northeast of Klawock (Figure 3-43). This Forest Service campground has 11 sites and is the largest and only developed campground on Prince of Wales Island. The campground has a launch dock and boardwalk trail.

Two potential sites for dispersed campsites have been identified in the Project Area. One would be located on the north end of Butterfly Lake, slightly outside the boundary of the Project Area. It would serve the needs of canoeists and kayakers using the Honker Divide canoe route. The other potential site is located on the coast across from Rosary Creek.

Dispersed camping occurs in other places throughout the Project Area to varying degrees. Field observation shows camping along logging roads and in quarries located alongside roads. Hunters sometimes drive to the ends of logging roads to gain backcountry access and camp near the ends of the roads.

Day-use Areas

The Gravelly Creek Day-use Area is the only developed day-use area in the Project Area. It is located approximately 3 miles west of the community of Thorne Bay and is adjacent to State Highway 929 (Figure 3-43). Activities at the day-use area include picnicking, fishing, and swimming. The area is popular with local residents and visitors.

There are also several undeveloped recreation areas that receive primarily local usage. These include the Thorne River Bridge on State Highway 929 (located several miles east of Thorne Bay,) which is used primarily by local residents for fishing and swimming; Goose Creek, which is popular with local residents and is accessed from either State Highway 929 or Forest Road 2030; and Angel Lake, which is upstream of the lower portion of Goose Creek. A day-use area at Balls Lake near the Eagle's Nest Campground is being planned in conjunction with Balls Lake boardwalk extension and a future Thorne Mountains trail.

Trails

There are two existing developed trails in the Project Area. The longer of the two is the 0.75-mile-long Rio Roberts trail, which starts at State Highway 929 and ends at a fish pass and

viewing platform. Parking at the trailhead is inadequate and consists of a pullout area adjacent to the highway.

The second existing trail is the 0.5-mile-long boardwalk trail at the Eagle's Nest Campground. The trail starts and ends at the campground and follows part of the southern shore of Balls Lake. An extension to the trail which would create a 2.7-mile loop around the lake has been recommended. The trail extension was given a high priority for development between 1992 and 1997 (Priority list).

A potential Thorne Mountain Trail would connect with the Balls Lake trail and wind its way uphill to several peaks in the Thorne Mountains.

Future Recreational Resources Near the Project Area

The Southeast Alaska Visitors Center (SEAVC) in Ketchikan was opened in 1995 under supervision of the Forest Service. SEAVC serves as a one-stop information center for visitors to Southeast Alaska. A Forest Service study examining an annex SEAVC facility in Hydaburg was completed in 1992, but no action has been taken to date. If the project is approved and an annex is built, visitation to Hydaburg and the Control Lake Project Area would undoubtedly increase.

The West Coast Waterway is located off shore along the west coast of the Project Area. Plans for the waterway include a series of recreation cabins, recreation shelters, and camping areas along the coast that would be located no more than a day's paddle (8 to 15 miles) apart. The cabins, shelters, and camping areas would be used primarily by mechanized and nonmechanized boaters using the waterway.

Existing Activities and Use Patterns

The Project Area offers opportunities for most of the outdoor recreation activities popular in Southeast Alaska. The Alaska Statewide Comprehensive Outdoor Recreation Plan (SCORP) lists the five most popular outdoor recreational activities for Southeast Alaska residents as motor boating, walking or running, fishing, driving for pleasure, and bicycling (hunting was not included on the list) (ADNR, no date). The Thorne Bay Ranger District's annual estimate of recreational use within the Thorne Bay District indicates that the five most popular activities within the District are viewing scenery, automobile travel, motor boating, saltwater fishing, and big game hunting. Participation in all of the activities occurs in the Project Area, although the extent is difficult to determine.

Although there are no figures available for the actual amount of recreational use within the Project Area, the Thorne Bay Ranger District's annual tally of District-wide use figures allows for some inferences. An estimated 194,300 recreation visitor days occurred within the District during 1992. Mechanized travel and sightseeing, the most popular activity identified, generated an estimated 101,400 recreation visitor days or 52 percent of the District's total. The following sections discuss the more popular recreational activities within the Project Area.

Mechanized Travel and Viewing Scenery

Prince of Wales Island's road system makes motor vehicle travel popular among residents and visitors. The Thorne Bay Ranger District ranked mechanized travel and viewing scenery as the most popular outdoor recreational activities in the District. Automobile travel was the most popular form of such travel, accounting for 32 percent of all RVD's. An estimated 9 percent of RVD's were devoted to sightseeing and 4 percent to power boating.

There are two main travel routes through the Project Area: (1) the Hollis-Klawock Highway, connecting Klawock with the Alaska Marine Highway ferry terminal in Hollis (which serves as

the entry way to Prince of Wales Island), and (2) State Highway 929 (comprising the Big Salt Road and the Thorne Bay Road) which connects Klawock with Thorne Bay. A third road, Forest Service Road 20 (or the North Island Road), is being upgraded from Control Lake north to Coffman Cove.

Boating is also considered mechanized travel, and is a very popular activity on the island. Estimating the amount of boating activity in the Project Area is difficult. However, boats are commonly used to access the coastal parts of the Project Area for recreational activities such as fishing, hunting, gathering activities, and viewing scenery. Recreation-oriented boats can be launched or moored at several locations in the Project Area. Anchorage areas have been identified by the Forest Service in several scenic locations (Figure 3-43); the amount of use is unknown.

Fishing and Hunting

An estimated 39,000 recreation days (14 percent of the Districts' total RVD's) was devoted to hunting fish and game in 1992 (USDA Forest Service, No Date a). The distinction between subsistence and recreational fishing, hunting, and gathering is often not clear and is controversial. For this report, data that were not specifically categorized as subsistence are assumed to be recreational. Because subsistence and recreational fishing and hunting often occur in the same locations, no distinctions were made in describing locations that supported both activities.

Fishing

The island's reputation for excellent fishing is widespread. Some consider it possibly the best steelhead fishing location in North America (Batin, 1992). The Project Area also supports an impressive array of anadromous fish including pink, chum, coho, and sockeye salmon; rainbow and cutthroat trout; and one species of char (Dolly Varden). Data regarding the types and numbers of anglers using the Project Area are very limited. The Forest Service estimated that in 1992 16,500 RVD's were associated with fishing activities in the Thorne Bay District. Although the number of anglers is relatively low compared to other areas of Alaska, the number of resident anglers on Prince of Wales is increasing. Between 1984 and 1989 the estimated annual number of resident anglers increased 54 percent, from 5,750 to 8,873, suggesting that this number will continue to increase (Mills, 1990).

There is a wide variety of saltwater fishing opportunities in the Project Area. Anadromous species in the marine environment include Dolly Varden char, king, coho, pink, and chum salmon. Dolly Varden and king salmon can be caught year round but are at their peak from June through mid-July. Coho are present from June through October and peak from mid-July through September. Pink and chum salmon move into the area in June, peak in July and August, and finish running by early September. Halibut and rockfish are also popular marine species and are caught primarily from boats at offshore banks and shoals. The peak fishing season for rockfish is early spring. Halibut are most commonly caught between mid-June and mid-September. These species are present year-round and the only restriction on seasons is a closure of halibut fishing during January. Popular marine fishing locations near the Project Area include the Shinaku Inlet for halibut, the west coast along San Cristobal Channel, and areas off shore of Salt Lake Bay and Nossuk Bay (ADF&G, 1989).

Youngsters enjoying sport fishing.

The ADNR reports that certain portions of the Project Area receive intense recreation use from local communities (ADNR, 1988). Use of the area by nonresidents appears to be much less than that of residents. Because of the distances to the site and the presence of better fishing in other areas, the Project Area is not visited by charter boats nearly as much as areas closer to Ketchikan.

Freshwater fishing opportunities in the Project Area are also abundant. Prince of Wales Island is best known for saltwater king salmon and freshwater steelhead fishing. Rainbow trout, cutthroat trout, and Dolly Varden are resident in the streams and some lakes and are available year-round. Coho, pink, and chum salmon all start moving into the river systems in early summer and are available into September. King salmon do not spawn on Prince of Wales Island, but do pass by the island in impressive numbers in the summer. Steelhead availability peaks in the early spring (April and May), then again in the early winter (November and December).

Anglers use several rivers and streams in the Project Area that support freshwater species. The ADF&G considers the Thorne River to be one of 19 blue-ribbon streams in Southeast Alaska. Other popular fishing streams in the Project Area accessible by road include Rio Roberts, Rio Beaver, North Thorne River, and Control Creek. The Forest Service has issued special-use permits to guides using the Thorne River, the North Thorne River, and Logjam Creek (see below).

Hunting

As with fishing, data concerning the types and numbers of hunters in the Project Area are limited. Forest Service estimates show approximately 10,900 RVD's (6 percent of the total) devoted to hunting big game, small game, upland birds, and waterfowl in the Thorne Bay Ranger

District in 1991 (USDA Forest Service, No Date a). Big game hunting was the most popular type of hunting (an estimated 6,200 RVD's).

The Sitka black-tailed deer is perhaps the most popular big game species hunted in the Project Area. The ADNR annually estimates the number of deer harvested for subsistence and nonsubsistence use by WAA (Galginaitis, 1994). The percentage of deer harvested by nonsubsistence users in WAA's in and near the Project Area varies from 8 to 50 percent of the total harvest (Table 3-55). Table 3-55 also illustrates that subsistence harvesting and recreational hunting occur in the same area.

Table 3-55
Deer Harvest Summary, 1987 to 1991, by WAA

WAA	Average Deer Harvest	Average Subsistence Harvest	Average Non-Subsistence Harvest	Nonsubsistence Percentage of Total
1318	358	329	29	8
1319	302	245	60	20
1323	127	96	31	24
1421	211	107	104	50
Total	998	777	224	22

SOURCE: ADF&G, 1991.

Galginaitis (1994) further discusses the distribution of game species and provides information concerning the harvest of big game and other species in and near the Project Area for subsistence purposes.

Hiking and Nonmechanized Water Travel

Hiking and walking in the Thorne Bay Ranger District accounts for an estimated 3,100 RVD's, or 1.6 percent of the total RVD's in the District. Canoeing and kayaking total an estimated 1,300 RVD's, with use throughout the District most likely occurring on fresh and salt water. An estimated 360 RVD's occur on the Honker Divide canoe route.

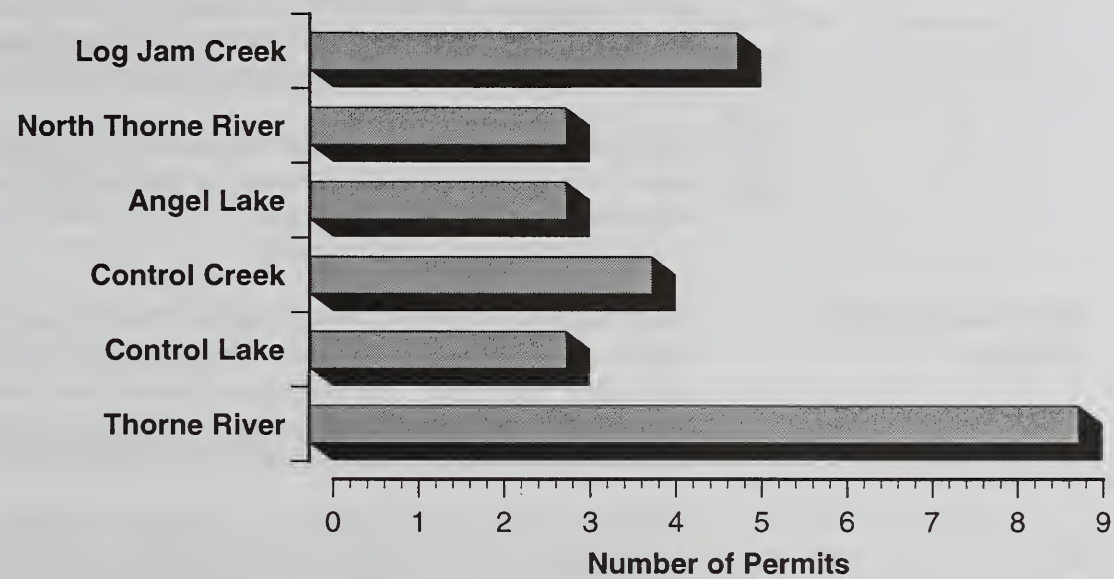
Other Activities

Many other outdoor activities take place within the Project Area, including activities such as gathering forest products (non-subsistence uses), viewing interpretive signs, environmental education, and others.

Commercial Outfitters and Special Recreational Use Permits

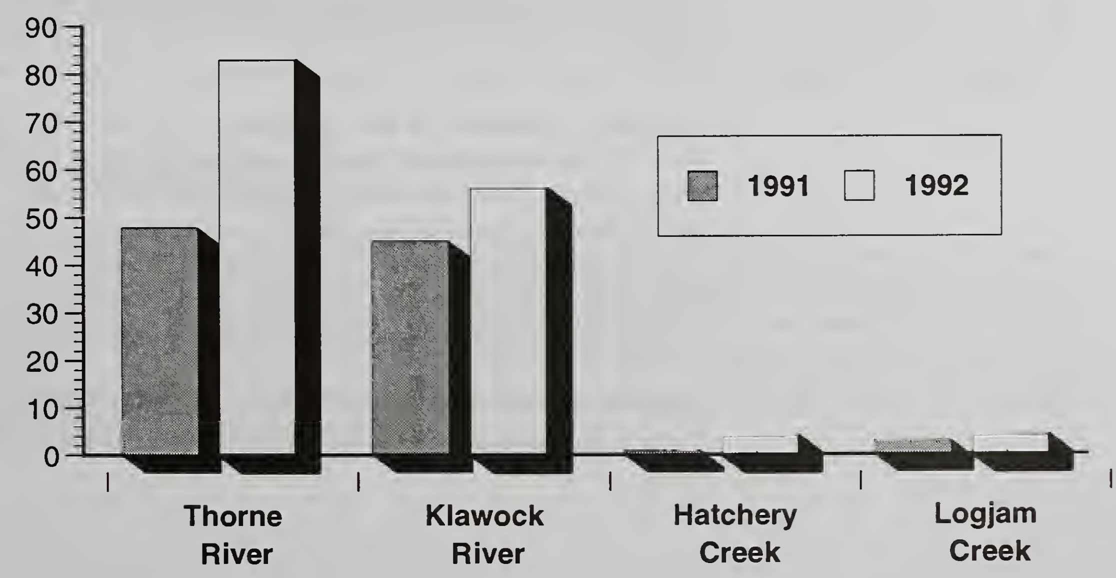
Some recreationists who fish in the Project Area use commercial outfitters and guides to take them to productive saltwater and freshwater fishing locations. Information concerning the intensity of commercial outfitter and guide use of saltwater areas in the Project Area is difficult to obtain. It is reasonable to assume that commercial outfitters and guides also use saltwater areas popular with recreational anglers.

Figure 3-44
Project Area Streams and Rivers for Which Outfitter/Guide Permits Were Requested



SOURCE: Forest Service 1992b.

Figure 3-45
Number of Service Days (Clients) Used by Outfitters/Guides in and Near the Project Area in 1991 and 1992.



Because the Forest Service requires special use permits for commercial outfitters and guides that use rivers and streams located in National Forests, it is possible to determine which rivers and streams in the Project Area are popular with them. In 1992, the Ketchikan Area Office of the Tongass National Forest completed an Environmental Analysis of outfitter and guide use of freshwater systems on Prince of Wales. The Environmental Assessment included a list of river and creek systems on Prince of Wales Island for which permits had been requested by outfitters and guides. The freshwater systems within the Project Area for which permits were requested and the number of permits requested are shown in Figure 3-44.

The Environmental Assessment also documented outfitter and guide reports of the location of areas to which they had taken customers in 1991 and 1992, and reports the number of service days (clients) at each location. Figure 3-45 shows that the number of customers being taken to fish in the Project Area has increased.

Wild and Scenic Rivers

The 42-mile-long Thorne River and Hatchery Creek system has nationally significant fisheries, wildlife, recreation and scenic values. Approximately 25 miles of the system are contained within the Project Area. The river system has not been given any official designation in the National Wild and Scenic River System or nomination to be included in the system. The system has been determined to be eligible for several classifications.

The lower six miles of the Thorne River (Segment 1) beginning at Thorne Bay meet the criteria for Recreation River classification. The remaining 36 miles of the Thorne River-Hatchery Creek corridor (Segment 2) meets the criteria for Scenic River classification.

Although 36 miles of this river system meet the criteria for Scenic River classification, the lower 12 miles of the system have been recommended in the TLMP (1997) for Recreation River designation, to allow for the development of potential recreation facilities and enhance public access to this river system.

Roadless Areas

This section identifies the roadless areas in the Project Area which meet the minimum criteria for potential inclusion in the National Wilderness System. Roadless areas identified in the TLMP (1997) inventory may be considered for wilderness recommendation or may be managed for a wide range of other resource management activities. Once an area is roaded, it is generally no longer available for wilderness consideration. Depending on when and how the activity was conducted, evidence of previous timber harvest, abandoned habitations, and historic mining may not necessarily result in an irreversible removal of land from future wilderness consideration.

To qualify as roadless, an area must contain at least 5,000 acres of undeveloped land which does not contain improved roads maintained for travel by passenger-type vehicles. However, areas of fewer than 5,000 acres may qualify if they constitute a self-contained ecosystem such as an island, are contiguous to existing wilderness, or are ecologically isolated by topography and manageable in a natural condition. Roadless areas may retain their roadless character by being managed for emphases which require relatively large, undeveloped, or natural areas, such as are usually required for old-growth habitat, scenic backdrops, or primitive recreation.

Three inventoried roadless areas identified in the TLMP (1997) are located in the Project Area. Table 3-56 shows the size of these roadless areas and the portion that lies within the Project Area.

Table 3-56
Inventoried Roadless Areas within the Project Area

Roadless Area	Total National Forest (acres)	Portion within Project Area (acres)	Percentage in Project Area
Kogish (509)	65,500	52,575	80
Karta (510)	49,799	20,968	42
Thorne River (511)	74,372	55,946	75

Source: USDA Forest Service, 1997.

Kogish (Roadless Area 509)

Most of the Kogish Roadless Area is found in the Project Area. Portions of the original roadless area have been extensively harvested. The more scenic areas are concentrated around the relatively rugged and diverse terrain of Kogish Mountain and Staney Cone and the intricate shorelines and island groups in Salt Lake Bay and Nossuk Bay. The only known use by local residents is occasional hunting. Subsistence use is high around Salt Lake Bay and Nossuk Bay.

Though roading and logging is evident on the perimeter, the natural integrity of the area itself is very good. Because of its difficult access, there is excellent opportunity for solitude, except for logging sights and sounds near the boundaries. Most recreation attractions are associated with the saltwater bays, anchorages, and channels on the west side where the ROS setting is primarily SPM.

The 1989-1994 Operating Period EIS for the KPC Long-term Contract approved the harvest of 2,026 acres near Kogish Mountain, Staney Cone, upper Staney Creek, and the Shaheen Creek. Such harvest has affected the character of about 10 percent of the roadless area. The geology of the area indicates some potential for discovery of valuable minerals. The rugged terrain and difficult access provide opportunities for dispersed recreation and the western and southern boundaries have potential for shelter sites and boat anchorages for small boats and kayaks.

Karta (Roadless Area 510)

The Karta Roadless Area is located on the south edge of the Project Area. Salmon Lake, Karta Lake, and the Karta River form the principle water systems within this roadless area. The area is accessible by water at Kasaan Bay and by road on the north, west, and south sides and receives substantial recreation and subsistence use. Known prehistoric village sites, rock art, and other evidence of cultural history can be found in the area. There are five recreation use cabins and 8 miles of trail within the roadless area.

The natural integrity of the area is very good. The Karta River drainage is so popular during the summer months that there is limited opportunity for solitude. Heavy cabin use, floatplane traffic, and trail use make encountering other parties during the summer highly probable. The alpine ridges that rim the Karta River drainage provide more opportunity for solitude. Extensive timber harvest along the periphery of this roadless area causes the edges to fall within the RM or SPM ROS classes.

The 1990 Tongass Timber Reform Act designated 39,894 acres of the Karta River area as Wilderness. A portion of this roadless area is also within the Maybeso Experimental Forest.

Thorne River (Roadless Area 511)

This roadless area includes a large part of central Prince of Wales Island and almost all of the Thorne River drainage. Access to the interior is by floatplane, canoe, or kayak and is advised for skilled boaters only. Notable features include the area around Snakey Lakes, an intricate complex of narrow, winding freshwater bodies north of the main Thorne River drainage, and the many areas of grassy meadows and large stands of spruce in portions of the Thorne River. The Honker canoe route within the area is used primarily by local recreationists using portions of the route. This roadless area has outstanding fish habitat, and subsistence and recreation use of the area is significant. Very good opportunities for solitude exist within the area, excluding the fringe where the sights and sounds of logging and traffic may be evident. The interior offers outstanding opportunities for primitive recreation, particularly canoeing and fishing.

The 1989-1994 Operating Plan EIS approved the harvest of 5,135 currently unroaded acres in the vicinity of the North Thorne River and Slide Creek. Under the TLMP Revision (1997), the Thorne River, Honker Divide, and Snakey Lakes area are to be managed mostly as Old Growth Habitat.

Wilderness

The Karta Wilderness is located immediately south of the Project Area. This 39,894-acre area includes the drainage of the Karta River system at the head of Kasaan Bay, about 5 miles from the communities of Kasaan and Hollis. The Karta River area contains high value fish habitat for coho salmon. The two major lakes, Salmon Lake and Karta Lake, are important spawning sites for sockeye salmon. One mine previously produced gold, and there are other known mineral deposits. Recreation use is high; the four Forest Service recreation cabins are in such demand that reservations are managed using a lottery system. Subsistence use is also very high.

Chapter 4

Environmental Consequences

Chapter 4

Environmental Consequences

Introduction

This chapter provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. It presents the expected effects on the physical, biological, social, and economic environments associated with implementation of the alternatives. All significant or potentially significant environmental consequences to each resource area are disclosed, including the direct, indirect, and cumulative effects. These effects may have consequences that are both beneficial and detrimental. The means by which potential adverse effects might be reduced or mitigated also are described for each alternative. Effects are quantified where possible, although qualitative discussions are often necessary. Finally, each section discusses monitoring recommendations for each resource area.

Analyzing Effects

Chapter 4 begins by detailing the environmental consequences of the alternatives by the same categories used in the description of the affected environment in Chapter 3 (i.e., timber, wildlife, economic, and social, etc.). Within each category, the direct, indirect, and cumulative effects are disclosed. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity but would be considered significant in the foreseeable future. Cumulative effects result from the incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. The reasonably foreseeable time frame over which both direct and indirect effects are estimated is here interpreted to mean through the year 2004. Cumulative effects are also projected for various resources up to the year 2054. The year 2054 is the year by which most areas within LUD's permitting timber harvest could be converted from old-growth to second-growth timber management.

The cumulative effects analysis in this document tiers to the current Tongass Land and Resource Management Plan (TLMP 1997). It also considers the 10-year timber sale action plan referenced in Appendix A which is used to project the volume range to be harvested in future operating periods. As a result, the cumulative effects do not depend entirely on the alternatives presented in this EIS. Rather, they include what may be expected under the direction detailed in the TLMP. The decisions made in the TLMP provide long-range

direction for management of the Tongass National Forest for the duration of the Forest Plan. Cumulative effects analyzed in this EIS include both the effects of this project and those projected by the 1997 TLMP Revision.

The following assumptions were made to assess the reasonably foreseeable effects to the year 2004. These assumptions reflect current management and technology of National Forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, guidelines, and BMP's for resource protection would be followed. These requirements are expected to be at least as stringent in the future as they are today.

- Timber sale planning would occur in an interdisciplinary fashion.

- All acres of suitable commercial forest land are equally subject to impacts.

- The no action alternatives would represent only a delay in implementing the TLMP and, based on volume projections, foreseeable cumulative effects would begin to occur before 2004.

- Future effects on resources from ongoing timber harvest and road construction will be similar to impacts projected for current alternatives.

Chapter 4 concludes with other environmental considerations that must be addressed under NEPA but do not fall under the categories discussed in Chapter 3. These topics include unavoidable adverse environmental effects, the relationship between short-term uses and the maintenance and enhancement of long-term productivity, the irreversible and irretrievable commitments of resources, possible conflicts between the proposed action and the plans of other jurisdictions, and other environmental considerations.

- *Short-term effects* are those that occur annually or within the first 10 years of project implementation.

- *Long-term productivity* refers to the capability of the land and resources to continue producing goods and services for 50 years and beyond.

- *Irreversible commitments* are decisions affecting nonrenewable resources such as soils, minerals, plant and animal species, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. The gradual decline in old-growth habitat or significant loss of soil productivity would be considered irreversible commitments. LUD's allowing land-altering activities were established by the Forest Plan, but the actual commitment to develop, use, or affect nonrenewable resources in the Control Lake Project Area was made in the development of this project.

- *Irretrievable commitments* represent opportunities foregone for the period during which resource use or production cannot be realized. These decisions are reversible, but the production opportunities foregone are irretrievable. An example of such commitments is the allocation of LUD's that do not allow timber harvest in areas containing suitable and accessible timber lands, a decision that is made at the Forest Plan level. For the time over which such allocations are made, the opportunity to produce timber from those areas is foregone, thus irretrievable.

Climate and Air Quality

Key Terms

Ambient air—that air, external to buildings, encompassing or surrounding a specific region.

All of the management alternatives are expected to have limited, short-term impacts on the ambient air quality. Alternative 1, the No Action Alternative, would result in the least emission of particulate and gaseous air pollutants in the near term. The potential for uncontrolled forest fires eventually might be increased under these alternatives, and the levels of air pollution that would result are likely to be comparable to those associated with other alternatives.

Local sources of airborne particulates produced or increased by the action alternatives include motor vehicle emissions, dust from road construction and motor vehicle traffic, residential and commercial heating sources, marine traffic, and emissions from burning at sawmills. No prescribed burning is proposed in any alternative so there will be no effect on air quality from this source. Fugitive dust generated from road construction and increased vehicular traffic may temporarily affect air quality.

The action alternatives would result in a continued supply of raw wood products to timber operators. It is the timber operator's responsibility to ensure that emissions from their mills are within legal limits. Wood debris is also burned by KPC at the Thorne Bay sort yard on Prince of Wales Island. This facility is also responsible for ensuring that emissions are within legal limits.

The direct and cumulative effects of the proposed action alternatives upon air quality will be a continuation of the existing local ambient air quality, which will be improved in the Ketchikan Area due to the closure of the KPC pulp mill.

This page left intentionally blank.

Geology, Minerals, and Karst

Key Terms

Carbonate rocks—rocks such as limestone and dolomite which contain a high content of calcium carbonate, $CaCO_3$.
Cave resources—any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.
Cave—any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.
Karst—a type of topography that develops in areas underlain by soluble rocks, primarily limestones.
Sinkhole— relatively shallow, bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet.

Introduction

Environmental consequences for timber harvests affecting the geological setting in the Control Lake Project Area must consider the presence of minerals and karst landscape. Timber harvests will have no impact on mineral resources, primarily because no deposits of commercial value have been identified within the Control Lake Project Area. No claims are filed in the Project Area and only one site has been investigated recently north of Black Bear Lake.

Karst landscape has been identified on approximately 18,000 acres of the total 201,000 acres within the Project Area, and represents less than 9 percent of the total area. Three harvest units in the action alternatives are underlain by limestone with some epikarst development. These 3 harvest units contain a total of about 99 acres from an initial harvest unit pool of 9,409 acres, or 1 percent of the proposed unit pool. These limited acreages of land and the localized nature of the outcrops tend to minimize the effects of harvest on karst resources.

Direct, Indirect, and Cumulative Effects on Mineral Resources

Timber harvest will not have a direct impact on the area's mineral resources. Since all shows of mineralization were located on harvested lands, the indirect effects of new harvests will improve the opportunity for mapping and prospecting for new deposits. Ease of access derived from logging road construction is a significant factor in the discovery of new prospects.

Cumulative effects of timber harvest will expose larger areas to evaluation for mineral development. As areas of mineral soil are exposed, the potential exists that more thorough evaluations will be possible.

Mitigation for Mineral Resources

One prospect, the Black Bear Lake site, was explored during 1993. It is located approximately two miles from a proposed harvest unit and within the same canyon. No evidence of claims, current or abandoned, was found during the field work. In the event that claim monuments or boundaries are encountered during harvest they should be protected and mapped for future reference.

Mining law gives citizens statutory right to enter public lands for mineral prospecting. Access cannot be prevented by road access management controls. However, entry can require permits to utilize restricted roads. In the event that unidentified claims or disputed areas are found they should be left undisturbed. No additional mitigation for mineral resources is recommended.

Monitoring for Mineral Resources

No project-specific monitoring of mineral shows, prospects or claims is recommended. Future prospecting will be regulated by existing laws, and the registration of claims will provide documentation for future reference.

Direct, Indirect, and Cumulative Effects on Karst Resources

The purpose of the Federal Cave Resources Protection Act (FCRPA) of 1988 is to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment and benefit of all people. Caves determined to be significant under the act are to be considered for listing on the National Significant Cave List. Cave management guidelines are contained in the 1997 TLMP Revision Standards and Guidelines (USDA Forest Service, 1997).

Caves are defined as "... any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge and which is large enough for a person to enter, whether the entrance is excavated or naturally formed. Such a term shall include any natural pit, sinkhole, or other opening which is an extension of a cave entrance or which is an integral part of a cave" (36 CFR 261.2). Whether a cave is considered "significant" is also defined under FCRPA in 36 CFR 290.3. All newly discovered caves in the Ketchikan Area are managed as Class I (36 CFR 290.3) or sensitive caves until an analysis of resource value has been completed. The several caves found within the Control Lake Project Area are in this category until additional studies are completed.

All government agencies that manage federal lands are required by the FCRPA to develop integrated management policies. To this end an interagency coordinating group of the Agriculture and Interior agencies was established to compile interagency procedures. These procedures were sent to field offices of the Bureau of Reclamation, USFWS, and National Park Service. The Forest Service has developed supplemental procedures.

The complexity of the karst landscape was emphasized during a Forest Service sponsored seminar in Ketchikan in February 1993. As one outgrowth of this seminar, the Forest Service appointed a Blue Ribbon Panel of karst experts to provide a Ketchikan Area review of forest conditions, karst features and management policies. The Panel's report, Karst and Cave Resource Significance Assessment, Ketchikan Area, Tongass National Forest (Aley et al., 1993), provided brief descriptions of field conditions and karst features, and they made recommendations regarding future studies and methods of analysis. The Panel emphasized the uniqueness and universally high quality of the southeastern karst systems, and they recommended the development of a karst vulnerability rating strategy.

Vulnerability mapping is a land management tool that has been used effectively in a number of karst areas. The thesis of this approach holds that not all karst development and resources have evolved equally. Vulnerability mapping utilizes the fact that some parts of a karst landscape are subject to appreciably greater resource damage potential and groundwater contamination risk than other karst lands. These differences are a function of the extent of karst development, the continuity of solution openings within the karst system, and the interdependency of associated resources that benefit from the karst groundwater system.

The Panel's recommendations have been incorporated into Forest Service operations policy with institution of the current karst studies of the Lab Bay Project Area, Tuxekan Island Project Area, and the newly authorized Ketchikan Area Karst Study. These studies evaluate each forest area with regard to geology, effects of elevation, slopes, hydrology, and the intensity of karst development. All criteria are ranked across each Project Area. Based on the above characteristics, the ranking process defines the level of vulnerability or risk to karst resources. Karst vulnerability has been ranked as low, moderate or high relative to the sensitivity to possible damage as a result of management effects, such as timber harvest activities.

As part of the Ketchikan Area Karst Study, karstlands within the Control Lake Project Area were rated for their vulnerability to surface disturbance. Of 6,884 acres underlain by carbonate rock, 2,559 acres were rated as low vulnerability, 1,919 acres were rated as moderate vulnerability, and 2,406 acres were rated as high vulnerability. The high vulnerability ranking is reserved for karst land that contains well-developed epikarst, significant caves, extreme density of karst features, or diversity of solution features on lands that contribute in an important manner to fisheries, wildlife habitat or water resources. An additional 11,263 acres of non-carbonate land are ranked as high vulnerability. This land is in watersheds which contribute surface runoff to high vulnerability karst areas. The inclusion of contributing watersheds in the high vulnerability rating is due to the potential for adverse effects from surface flow into karst systems. The vulnerability rating of contributing watersheds can be modified (downgraded) where on-site investigation demonstrates that surface flow from the watershed does not connect to any insurgence in the karst areas downstream.

Some of the karst terrain in the Project Area has been previously harvested. The effects of past logging on karst terrain include loss of sediment and clogging of solution systems by redirection of drainages and disposal of slash debris. Indirect effects on karst as a result of logging can include redirection of runoff, changes in pH of surface waters, and possible changes to the micro climate around cave entrances. These indirect effects can change solution and deposition characteristics within the underground environment. Harvested karst terrain east of Cutthroat Lake, where no buffers around karst terrain and no drainage control have been implemented, display debris-choked grike systems. While disruption of the sinkhole and grike systems is apparent, previous timber harvest or road construction has not affected any known cave resources in the Control Lake Project Area. Future protection measures will be necessary in order to prevent damage for harvest units with significant karst resources. Avoidance of caves and karst terrain and/or prescribing site-specific mitigation measures will help minimize long-term cumulative effects on the cave resources.

On-site field studies identified a narrow belt of karst extending southward parallel with the central boundary of the Project Area, curving southwestward south of Cutthroat Lake, and pinching out above Control Lake. Prior timber harvest has exposed extensive karst resources southeast of Cutthroat Lake. Deeply incised ridges with grikes and small sinkholes are found in cleared areas. The limestone layers in this vicinity are less than 1,000 feet long and about 200 to 300 feet thick. Two separate layers were found, both dipping about 45 degrees to the west-northwest into the ridge. The two layers are discontinuous at the surface and may also be discontinuous at depth. The several caves identified in the Control Lake Project Area have depths of less than 100 feet, and some caves are dry with evidence of past stream action. Numerous resurgences are present. Most observed insurgences are small and not readily accessible to humans.

Six original harvest units were identified as containing karst. Three of these units were dropped from the project unit pool due to the presence of very well developed karst or significant karst features. The remaining three units were partially or fully underlain by limestone.

The harvest units that are currently underlain by limestone contain only minor karst features. The karst in these units was rated as low or moderate vulnerability. Deep soils, low relief, gentle slopes and a limited extent of karst development within and adjacent to these harvest units implies a low to moderate risk of damage to the karst resources from the effects of harvest.

Project-specific effects of harvest on karst areas by Alternatives 10, 11, and 12 are shown in Table 4-1. This table shows the acres of karst in harvest units and the miles and acres of proposed roads on karst areas by alternative. Alternatives 11 and 12 would include a small

harvest area (about 10 acres) and less than 1 mile of road on karst land. Alternative 10 would not intersect any karst lands. This represents 0.5 percent or less of the total harvest area in any single alternative.

Table 4-1
Environmental Consequences of Alternatives on Karst Areas[1/]

Item	Units	Alternative 10	Alternative 11	Alternative 12
Harvest Units	acres (percent of total harvest area)	0	10 (0.3%)	10 (0.2%)
Roads	miles	0	0.8	0.8
	acres[2/] (percent of total harvest area)	0	7 (0.2%)	7 (0.2%)

1/ Areas include all types of karst within unit boundaries.

2/ Acres calculated assuming a 75-foot road corridor width.

Because of the limited extent of the limestone pods and the relative scarcity of karst in the Project Area, the long-term cumulative effects to cave resources are expected to be minimal. This assumption is based on observations of groundwater resurgences at the basal contact of the limestone units. Groundwaters apparently resurge relatively close to their insurgence, which indicates a potentially limited extent of limestone. Minimal long-term cumulative effects are dependent on the avoidance of upslope areas, effective use of buffers, and continued stabilization of erosion and runoff.

Mitigation for Karst Resources

Potential effects to karst and cave resources have been minimized or eliminated due to mitigation measures. Three logging units with prominent karst were deleted during field studies. Three additional units contained pods of limestone with accompanying caves or resurgences. These units have been modified so that significant karst features are excluded from the unit boundaries. In addition, the harvest units have no-cut buffers to protect remaining (minor) karst features that were observed in the field and to protect their contributing upper watershed area.

The 1997 TLMP Revision Standards and Guidelines provide guidance for protection of karst resources. Mitigation of potential damage to karst resources include no-cut buffer zones around cave entrances, insurgences and resurgences, and limitation of logging within watersheds upslope of significant karst areas. Buffers of sufficient width to provide windthrow protection and a capture area for sedimentation have been defined. No-cut buffers take into consideration the soil properties within the buffer zone, drainage characteristics, slope gradient and wind-fast characteristics of the trees within the proposed zone. All access roads located above the mapped limestone outcrops require drainage control to direct runoff from roadside ditches away from the limestone outcrops. The size of the limestone outcrops are small. Buffers, drainage control and special treatment requirements are not expected to require a significant effort.

Additional karst resource mitigation can be provided during final harvest unit layout. The Ketchikan Area karst resource specialist shall review final unit layout during final review of all units located on vulnerable karstlands to ensure that appropriate mitigation measures are implemented.

Cave resources offer recreational opportunities in the Project Area. Cave Management direction are provided in the 1997 TLMP Revision to help protect fragile areas and provide safe recreational opportunities. Following further exploration and inventory, some systems will be open to controlled public access, and some likely will be closed to protect fragile cave resources.

Monitoring for Karst Resources

The Forest Plan recognizes three distinct types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if projects and activities comply with Forest Plan standards and guidelines. Effectiveness monitoring determines whether the standards and guidelines achieve the desired result. Validation monitoring determines whether the assumptions in the Forest Plan regarding the relationship between management actions and their effects are correct, or if there is a better way to depict these relationships.

In early 1994, the Ketchikan Area adopted a Monitoring Strategy to more specifically guide area monitoring efforts. The Control Lake Project Area will contribute towards meeting overall Forest Plan and Ketchikan Area Monitoring Strategy goals through the selection of proposed harvest units/roads for monitoring.

This page left intentionally blank.

Soils

Key Terms

Glacial till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
Mass movement index (MMI)—rating used to group soil map units that have similar properties with respect to the stability of natural slopes.
Mass movement—general term for a variety of processes by which masses of earth material are moved downslope by gravity either slowly or quickly.
McGilvery soil—shallow, forested, organic soil developed over bedrock.
Sediment—solid materials, in suspension or transported by water, gravity, ice, or air.
Soil productivity—capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.
V-notch—a shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Introduction

Soil disturbance is an unavoidable consequence of timber harvest and road construction. Even though mitigation steps are taken to reduce disturbance, it is not possible to eliminate it completely. The level of disturbance varies with management practices and site characteristics. Areas most susceptible to disturbance from management activities were identified during both office preview and field verification of units and were eliminated from the harvest units. The areas that were eliminated included those of very high mass movement hazard and areas with greater than 41 percent very shallow organic soils (i.e., McGilvery series).

Soil impacts can be reduced below threshold levels by adhering to Soil Management Handbook standards and guidelines FSH 2509.18, BMP's of the Soil and Water Conservation Handbook FSH 2509.22, and the application of erosion control provisions of the timber sale contract. The standards and guidelines, BMP's, and contractual provisions include specific logging requirements such as one-end or full-log suspension, split yarding, and controlled felling.

Direct and Indirect Effects

The following section discusses the effects of timber harvest on soil productivity and soil erosion. Soil productivity is evaluated by the amount of soil disturbance associated with timber harvest and road building. Soil erosion is evaluated by considering the acres of soil exposed in timber harvest units and the potential for landsliding or mass movement from timber harvest and road building.

Soil Productivity

Soil Disturbance (Displacement)

Timber harvest may result in soil displacement, exposure, or puddling, which can reduce soil productivity. Soil displacement is the main soil disturbance in southeast Alaska (FSH-R10-Supplement 2500-92-1). It is defined as the horizontal movement of soil from one place to another by mechanical forces, such as those associated with logging equipment. Observations in the Ketchikan Area indicate that the degree of disturbance is related to the type of yarding that occurs at a harvest unit. Table 4-2 shows potential acres of soil disturbance based on acres harvested and logging system. The values shown are based on preliminary observations, but they provide an index to allow comparison of alternatives. These values are all below the 15 percent soil disturbance threshold (detrimental displacement) established in FSH 2500. Ground-based logging systems that achieve partial to full suspension are assumed to produce 6 percent soil disturbance and other ground-based logging systems are assumed to produce 12 percent soil disturbance, based on observations of harvest units in the Ketchikan Area (USDA Forest Service, 1993). Soil disturbance associated with helicopter yarding ranges from 1 to 5

percent (USDA Forest Service, 1993; Clayton, 1981); a median value of 3 percent was used. Soil disturbance ranges from 101 to 274 acres or approximately 6 to 8 percent of the acres harvested. Any impairments to soil productivity would be reduced as the site is revegetated. Consequently, effects beyond 5 to 10 years would be small.

Table 4-2
Estimated Soil Disturbance by Watershed due to Harvesting (in Acres)

Name	Watershed	Alt. 10	Alt. 11	Alt. 12
Unnamed	000Z	0	0	0
Unnamed	BT2A	0	0	0
Unnamed	BT9A	0	0	0
103-70-03	BW1A	0	0	0
103-80-56	BW2A	0	0	0
Unnamed	BW3A	0	0	0
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	9	12
Unnamed	C49B.0001	0	3	3
Goose Creek	C49B.10,.11,.12	17	25	25
Control Creek	C49B.20,.24,.25,.26	1	13	17
Rio Beaver	C49B.21	38	35	39
Rio Roberts	C49B.22	2	32	32
Upper Thorne R.	C49B.23	0	14	38
North Thorne R.	C49B.27	0	6	6
Steelhead Creek	C95B	35	40	44
Election Creek	C96A	0	6	6
Shinaku Creek	D03B	7	18	18
103-60-05	D08A	0	11	31
11 Mile Creek	D09A.0100	0	0	0
Goodrow Creek	D10A	0	0	0
Unnamed	D12A.0001	0	1	1
Nossuk Creek	D12A.01	0	2	2
103-80-46	D14A	0	0	0
103-80-50	D15A	0	0	0
James Creek	D16A	0	0	0
TOTAL		101	215	274

Road Construction Acreage

The construction of roads, landings, and excavation of quarries removes soil from the forest land base. Assuming a 75-foot disturbed road corridor, each mile of road would cut, fill, or otherwise disturb approximately 9 acres of land. In addition, approximately, 1.5 acres of soil are disturbed for the average quarry, which supplies rock for approximately 2 miles of road. Additionally, one or more landings per unit would require about 0.2 to 2 acres depending on the logging system and the number of settings. As a worst-case analysis, all of this land is considered to be permanently taken out of production. Table 4-3 shows the acres of road-associated disturbance, including quarries and landings, for the action alternatives. Alternative 12 has the highest acreage of road-associated disturbance followed by Alternatives 11 and 10, in that order.

Table 4-3

Estimated Soil Disturbance by Watershed due to Road Construction (in acres—includes quarries and landings)1/

Name	Watershed	Alt. 10	Alt. 11	Alt. 12
Unnamed	000Z	0	0	0
Unnamed	BT2A	0	0	0
Unnamed	BT9A	0	0	0
103-70-03	BW1A	0	0	0
103-80-56	BW2A	0	0	0
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	43	82
N. Thorne River	C45D, C49B.2700	0	0	0
N. Thorne River	C49B.2700	0	0	0
N. Thorne River	C45D, C49B.2700	0	20	20
Unnamed	C49B.0001	0	6	6
Goose Creek	C49B.10,.11, .12	38	97	97
Control Creek	C49B.20,.24,.25,.2	2	13	30
Rio Beaver	C49B.2100	83	86	104
Rio Roberts	C49B.2200	16	33	34
Upper Thorne River	C49B.2300	0	19	84
Paul Young Creek	C72A	2	2	2
Black Bear Creek	C93A	0	10	10
Steelhead Creek	C95B	96	155	164
Election Creek	C96A	0	23	23
Staney Creek	C97C, C99C	8	11	11
Shinaku Creek	D03B	26	79	79
103-60-05	D08A	0	85	136
11 Mile Creek	D09A	0	0	0
Goodrow Creek	D10A	0	0	0
Unnamed	D12A.0001	0	14	14
Nossuk Creek	D12A.01	0	9	9
103-80-44	D13A	0	0	0
103-80-46	D14A	0	0	0
103-80-50	D15A	0	0	0
James Creek	D16A	0	0	0
TOTAL ACRES		271	705	905

1/ Based on the assumption that 9 acres are disturbed per mile of road for the road corridor and an additional 1 acre is disturbed per mile of road for quarries and landings (10 acres per mile total).

Soil Erosion

Surface Erosion

Soil disturbance during timber harvest can reduce the ability of the organic mat and the mineral soil to absorb water, thereby making increased surface erosion possible. Soil disturbance and associated soil erosion can contribute to reduced soil productivity. This effect will occur for a short period of time until the site is revegetated, typically 3 to 5 years.

As shown in the *Soil Disturbance* subsection, Alternative 12 has the most acres disturbed while Alternative 10 has the least. In general, surface soil erosion that occurs within timber harvest units has a limited possibility for contributing sediment to streams. The main BMP's to minimize soil disturbance near Class III streams are buffers, controlled felling of trees away from streams, and yarding these trees away from streams (split yarding). Site-specific recommendations for controlled felling and split yarding are contained in the unit cards. The potential for sediment delivery from all harvest units to streams is considered in more detail in the *Water, Fish, and Fisheries* section.

Landslides

Landslides are most likely to occur when timber harvest and road construction occurs on high and very high MMI soils. The prefield and field verification processes eliminated areas on very high MMI soils from the harvest units. In addition, during field verification logging road access to several areas indicated an unacceptable landslide risk to both the soil resource and the road. Timber harvest units beyond the roaded sites were prescribed for helicopter logging. The acres of management activity on high MMI soils quantifies the areas most sensitive to mass movement. Table 4-4 shows the acreage of high MMI soils within harvest units by watershed.

Table 4-4
Acreage of Harvest Units on High MMI Soils

Name	Watershed	Alt. 10	Alt. 11	Alt. 12
Unnamed	000Z	0	0	0
Unnamed	BT2A	0	0	0
Unnamed	BT9A	0	0	0
103-70-03	BW1A	0	0	0
103-80-56	BW2A	0	0	0
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	69	82
Unnamed	C49B.0001	0	3	3
Goose Creek	C49B.10,.11,.12	62	105	105
Control Creek	C49B.20,.24,.25,.2	0	24	31
Rio Beaver	C49B.2100	286	324	328
Rio Roberts	C49B.2200	9	42	42
Upper Thorne R.	C49B.2300	0	149	317
N. Thorne R.	C49B.2700	0	40	40
Steelhead Creek	C95B	157	226	259
Election Creek	C96A	0	35	35
Shinaku Creek	D03B	123	379	379
103-60-05	D08A	0	13	14
11 Mile Creek	D09A.0100	0	0	0
Goodrow Creek	D10A	0	0	0
Unnamed	D12A.0001	0	5	5
Nossuk Creek	D12A.01	0	15	15
103-80-44	D14A	0	0	0
103-80-46	D15A	0	0	0
103-80-50	D16A	0	0	0
TOTAL		637	1,429	1,655

Mass wasting is a naturally occurring phenomenon in the Project Area (Swanston, 1969). However, it is well known that timber harvest increases mass wasting frequency over natural background levels (Sidle et al., 1985). Mass wasting occurs when the gravitational force overcomes the cohesive strength of the soil. This may occur when local increases in the water table create increased pore water pressures that decrease the friction between soil particles to the point that they move downslope under the influence of gravity. This increase in pore water pressure is most common at the soil-till contact in soils developed on compact till. Timber harvest accelerates this process in two ways. First, transpiration is initially decreased with tree removal. This increases soil moisture and allows a higher rise in the water table for a given rainstorm, which is more likely to destabilize the slope (Wu and Swanston, 1980). Second, tree removal ultimately results in the decay of tree roots. Tree roots add cohesion to the soil, which counteracts the increased pore pressure caused by rises in the water table. As the roots decay the added cohesion is lost and consequent increases in mass-wasting frequency begin about 3 to 7 years after harvest (Bishop and Stevens, 1964; Sidle et al., 1985; Swanston and Marion, 1991).

Swanston and Marion (1991) evaluated mass-movement frequency under natural and harvest conditions throughout Southeast Alaska over a 20-year period (1963 to 1983). The observed landslide rate in timber harvest areas was 0.021 landslides per 1,000 acres per year. Harvesting increased the landsliding rate by 3.5 times over natural conditions. The rate is based on a very large area (202,000 acres), however, and differences in topography, geology, and local site conditions make this rate unreliable as a predictor of landslide activity at a specific site.

Swanston and Marion (1991) also found that only a small percentage of the coarse sediment transported by these landslides reached streams. The landslide survey categorized 23 percent of all landslides as debris torrents that occur in deeply cut V-notch gullies. Long-term impacts (greater than 10 years) to channel form and function and to fish habitat would be anticipated for Class I channel segments directly affected by a large landslide (Hogan and Wilford, 1989). Based on these results, there is about a one-in-four chance that any management-related landslide will have an impact on Class I streams and only a small chance that impacts on fish habitat could occur. It can be inferred that the majority of these landslides would affect primarily Class III stream channels, since only about three percent of all natural and management-induced slide events in this survey were shown to directly affect Class I streams. However, the slides reaching Class II and III streams may indirectly affect Class I streams, as finer fractions of sediment from debris can easily be transported downstream.

Cumulative Effects

An estimate of the cumulative soil effects for the Project Area can be obtained by assuming that the level of harvesting would remain relatively constant over the rotation period of 100 years. Cumulative effects of these actions on long-term soil productivity are directly related to the amount of soil disturbance that occurs through time and the amount of recovery that takes place in the soil system in that time. Soil disturbance, erosion, and the associated loss of productivity resulting from timber harvest activities will occur. Most of these effects will be relatively short-term; they will last until revegetation occurs subsequent to each entry. Revegetation sufficient to provide ground cover in most areas will occur within 3 to 5 years of timber harvest. However, some disturbed areas may become brushfields, inhibiting timber production for a number of years.

The effects on the soil resource by mass movement can be evaluated by examining the projected total timber harvest and the harvest on high MMI soils that would occur between 1994 and 2054. Under Alternative 12, approximately 1,655 acres of high MMI soils and 4,453 total acres would be harvested. After implementation of Alternative 12, there would be less than 19,000 total acres of old-growth remaining in the suitable timber base to be harvested through the end of the rotation period, or about 10 percent of the Project Area. The impacts associated with this

additional harvest would be dispersed through time, averaging less tan 400 total acres per year (see *Silviculture, Timber and Vegetation* section). Mass movement hazard peaks about 3 to 7 years after timber harvest as root decay decreases soil cohesion. As revegetation occurs and roots systems develop, soil cohesion increases and the mass movement hazard in harvested areas decreases. Mass movement hazards from roads may persist longer depending on local conditions and road maintenance and abandonment procedures. Consequently, after about 20 years from any individual entry, the effects diminish significantly. Individual watersheds could experience locally significant effects from landslides, but when considered over the entire Project Area, the cumulative effects should be within acceptable levels during the period from 1997 to 2054.

Cumulative effects from road and associated landings and quarries can be estimated by adding existing and proposed acreages of each. Approximately 97 miles of new roads would be constructed or reconstructed in Alternative 12. These roads would increase the percent of roaded area in some watersheds significantly. Watersheds with a high percentage of their area in roads would be susceptible to sedimentation impacts if BMP's are not properly implemented.

Loss of soil productivity is the other major effect of roading. To minimize adverse soil productivity effects, management activities during this interval will utilize existing BMP's and any new soil conservation practices as they are developed and implemented. By maintaining soil productivity during this period, the cumulative effects of these actions will remain within soil productivity thresholds.

Mitigation

Mitigation for protecting the soil resource occurs through both planning and implementation. Mitigating the effects of timber harvest on soils includes avoidance (for example, excluding road construction and timber harvest on unstable soils). Avoidance begins as planning-level mitigation through the soil survey of the area, which provides a field reconnaissance of the soil resource and sensitive soil areas. For the Control Lake Project, this information, combined with vegetation mapping and aerial photograph interpretation, provided an initial level of screening for timber harvest unit and road placement which allowed avoidance of very high mass movement soils and wetlands. Field verification of the units and roads resulted in site-specific identification of very high mass movement soils and areas dominated by McGilvery soil. These observations resulted in the exclusion of such areas from harvest units and, in some cases, elimination of entire harvest units (Mitigation Measure F1). Specific harvest units affected by these and other mitigation measure are identified in Appendix C.

Another means of reducing landslide potential and to maintain long-term productivity is to require partial or full suspension on harvest unit areas that have high mass movement potential or McGilvery soils (Mitigation Measure F3). Harvest units with partial or full suspension requirements are identified in Appendix C and on the unit cards (see Appendix F of the Draft EIS or Appendix D of the Supplemental Draft EIS for the ones that have changed substantially).

Additional soil mitigation can also be provided during final harvest unit layout. A soils specialist will check off mitigation measures on the final unit and road cards. The sale administrator will be responsible for ensuring the implementation of contract items. If further field examination of the harvest units identifies areas with questionable stability or a high percentage of McGilvery soils, then additional site investigation by a soil resource specialist will occur and appropriate recommendations will be incorporated into the final unit design cards. If soil stability problems or questions arise during road construction and timber harvest, a soil resource specialist will investigate and provide prescriptions to deal with the specific situation. Additional mitigation measures to control erosion are discussed in the *Water, Fish, and Fisheries* section of this chapter.

Monitoring

Implementation monitoring for the soil resource is related to soils and to water quality issues. The timber sale contract administrator, as the person with day-to-day project contact, will be primarily responsible for ensuring the implementation of BMP's as stated in the unit cards. After avoidance of hazardous soil areas, the main BMP's to protect the soil resource are directional falling of trees away from streams and yarding trees away from streams (split yarding) to minimize soil disturbance near streams.

The Tongass National Forest Ketchikan Area Monitoring Strategy (USDA Forest Service, 1994) specifically addresses BMP monitoring (see *Monitoring* subsection in the *Water, Fish, and Fisheries* section). In addition, it describes a field monitoring activity directed at measuring the effectiveness of the standards and guidelines in preventing significant or permanent impairment of soil productivity (Watershed Monitoring Item 4).

This page left intentionally blank.

Wetlands, Floodplains, and Riparian Areas

Key Terms

Aquatic ecosystems—the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein.
Estuarine—deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but which have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is diluted by freshwater runoff.
Hydrophytic vegetation—plants typically found in wetlands and dependent upon wetland moisture regimes for growth and reproduction.
Muskeg (peatlands)—a type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.
Primary succession—vegetation development that is initiated on surface exposed for the first time, which has never before supported vegetation.
Riparian areas—geographically delineable areas with distinctive resource values and characteristics that are comprised of a stream channel, lake or estuary bed, the water itself, and the plants that grow in the water and on the land next to the water.
Riparian ecosystems—a transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive plant communities that require free or unbound water.
Riparian management area—land areas delineated in the Forest Plan to provide for the management of riparian resources.
Secondary succession—the process of reestablishing vegetation after normal succession is disrupted by fire, cultivation, timber harvest, windthrow, or any similar disturbance.
Wetlands—areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetlands

Timber harvest and road construction will affect wetlands. The amount, frequency, and distribution of wetlands in the Project Area make it impossible to avoid road construction on wetlands. Additionally, forested wetlands are an important component of the forest land base. The acreage of wetlands harvested by watershed for the alternatives is shown in Table 4-5. Acres of wetlands are determined from the GIS soil mapping unit (SMU) layer. This gives the average percentage of wetlands (muskegs and forested) for the SMU in which the harvest unit occurs. Hence the acres of wetlands are the product of the unit acres and the wetland percentage for each soil type found within each unit.

Alternative 12 has the most calculated muskeg inclusions followed by Alternatives 11 and 10, in that order. Note that the values are from GIS analysis and are maximum values. Field verification indicates that muskeg inclusions are less than 5 acres within any individual harvest unit.

Forested wetlands within harvest units range from 597 acres for Alternative 10 to 1,821 acres for Alternative 12. Note that forested wetland acres are based on GIS analysis and represent maximum values.

Table 4-5
Harvest Area on Wetlands by Alternative and Watershed (in Acres)

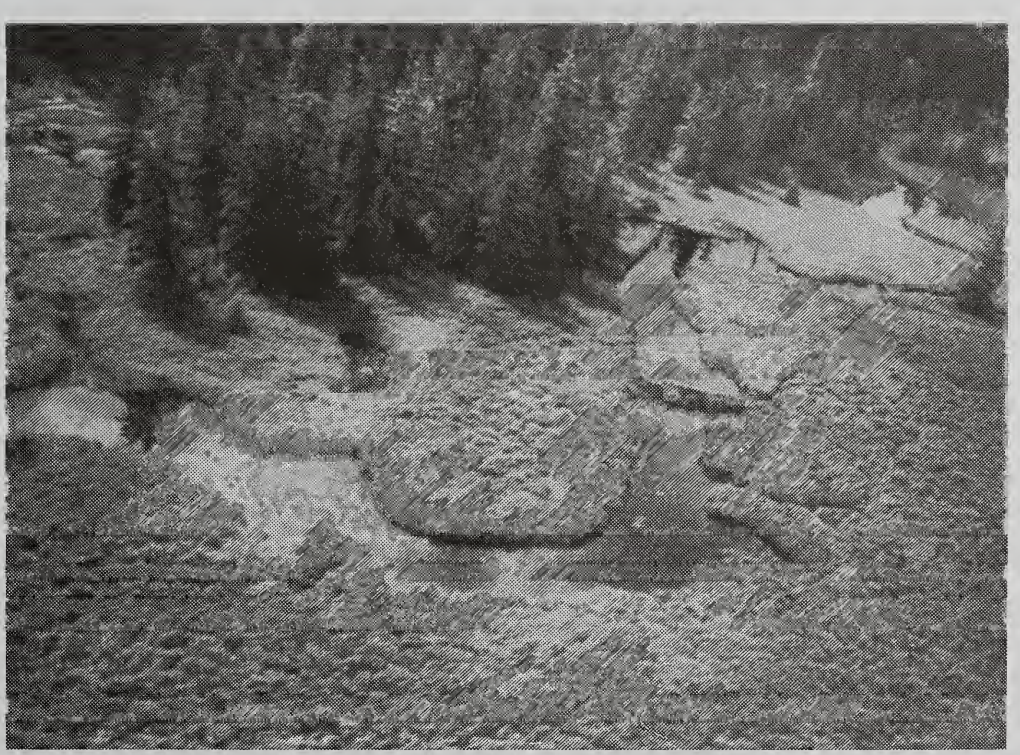
Name	Watershed	Alt. 10	Alt. 11	Alt. 12
103-80-37	BT2A	0	6	6
103-70-03	BW1A	0	0	0
103-80-56	BW2A	0	0	0
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	148	190
North Thorne River	C45D,C49B.27	0	57	57
Thorne River	C49B,C45D	0	0	0
Unnamed	C49B.0001	0	27	27
Goose Creek	C49B.10,.11,.12	104	207	207
Control Creek	C49B.20,.24,.25,.2	1	91	102
Rio Beaver	C49B.2100	253	265	295
Rio Roberts	C49B.2200	7	19	19
Upper Thorne River	C49B.2300	0	114	333
Paul Young Creek	C72A	0	0	0
Black Bear Creek	C93A	0	0	0
Steelhead Creek	C95B	232	433	474
Election Creek	C96A	0	28	28
Staney Creek	C97C,C99C,B59C	0	0	0
Shinaku Creek	D03B	118	260	260
103-60-05	D08A	0	91	232
Elevenmile Creek	D09A	0	0	0
Goodrow Creek	D10A	0	0	0
Unnamed	D11A	0	0	0
Nossuk River	D12A.01	0	28	28
Unnamed	D12A.0001	0	10	10
103-80-46	D14A	0	0	0
103-80-50	D15A	0	0	0
James Creek	D16A	0	0	0
Total Forested Wetland		597	1,444	1,821
Total Muskeg		118	341	447
Total Wetland		715	1,785	2,268

In general, areas (2 acres or larger) of those wetland soils (Kaikli, Karheen, Kitkun, Maybeso) designated for protection by the ROD of the new Forest Plan (1997) were excluded from the proposed harvest units. However, because the Control Lake unit pool was field reviewed before these soils were designated for protection, larger inclusions may be present and may need to be deleted from the units prior to harvest. Based on GIS analysis of associations and complexes containing these soils, the areas with the greatest likelihood of larger inclusions within units are the Logjam Creek and Upper Thorne River watersheds. Units of particular concern in these watersheds are 575-408, 575-413, 575-418, 575-419, 577-416, 577-417, 577-418, 577-423, 577-426, and 577-430. Outside of these two watersheds there are scattered units of concern. Of particular note, because of the high percentage of the units mapped with soil associations or complexes containing protected soils, are units 578-401 in

the North Thorne River Watershed, 595-413 in the Steelhead Creek Watershed, and 596-407 in the Control Lake Creek Watershed. Of the 13 units identified as most likely to contain inclusions of protected soils, none are included in Alternative 10, 8 are included in Alternative 11, and all 13 are included in Alternative 12. These and all other units in the selected alternative would need to be reviewed and adjusted if large inclusions are found.

Timber harvest on forested wetlands will likely initially increase soil moisture because of reduced transpiration resulting from tree removal. This effect will occur until trees are re-established. Revegetation of forested wetland sites are expected to occur in the same time frame as for other forested sites, usually within 3 to 5 years. Consequently, long-term effects to forested wetlands are expected to be minor. Timber site productivity on wetland soils, however, is typically lower than on better-drained sites. Growth rates on wetland sites are expected to be lower than on nonwetland sites, and merchantable timber may not be available in a 100-year rotation.

The most direct effect on wetlands in the Project Area would be the fill associated with road construction. The construction of roads would permanently remove the roaded portions of the wetlands from production thereby eliminating their biological functions. Road routing for the Control Lake Project attempted to avoid wetlands; however, the extent and distribution of wetlands made this impossible. A number of BMP's and mitigation measures deigned to minimize effects on wetlands have been incorporated into road design (see Chapter 2, mitigation measures). Table 4-6 shows the acres of road construction by wetland type for the alternatives by watershed. The average disturbance width is calculated at 75 feet; however, construction on wetlands are often easier than on steep slopes and the actual width should be less. Consequently, the road disturbance acres shown are maximum values. Alternative 12 has the highest acres of muskeg affected, followed by Alternatives 11 and 10. In regards to forested wetland acreage, the alternatives rank the same as for muskegs.



Upper Hatchery Creek south of Lake Galea

Table 4-6
Road Construction on Wetlands by Alternative and Watershed (in Acres)[1/]

Name	Watershed	Alt. 10	Alt. 11	Alt. 12
103-80-37	BT2A	0	1	1
103-70-03	BW1A	0	0	0
103-80-56	BW2A	0	0	0
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	33	66
North Thorne River	C45D,C49B.27	0	11	11
Thorne River	C49B,C45D	0	0	0
Unnamed	C49B.0001	0	4	4
Goose Creek	C49B.10,.11,.12	25	54	54
Control Creek	C49B.20,.24,.25,.26	1	8	15
Rio Beaver	C49B.2100	54	53	64
Rio Roberts	C49B.2200	9	10	11
Upper Thorne River	C49B.2300	0	11	56
Paul Young Creek	C72A	2	2	2
Black Bear Creek	C93A	0	8	8
Steelhead Creek	C95B	62	92	98
Election Creek	C96A	0	17	17
Staney Creek	C97C,C99C,B59C	0	3	3
Shinaku Creek	D03B	19	25	25
103-60-05	D08A	0	49	84
Elevenmile Creek	D09A	0	0	0
Goodrow Creek	D10A	0	0	0
Unnamed	D11A	0	0	0
Nossuk River	D12A.01	0	3	3
Unnamed	D12A.0001	0	11	11
103-80-46	D14A	0	0	0
103-80-50	D15A	0	0	0
James Creek	D16A	0	0	0
Total Forested Wetland		117	253	355
Total Muskeg		54	141	178
Total Wetland		170	394	533

1/ Assumes a 75-foot wide road bed; actual disturbance is normally substantially less than this. Includes the road area within harvest units.

Estuaries

Forest-wide standards and guidelines require that estuaries be buffered by a 1,000-foot no-harvest zone. Road construction should avoid this buffer but can occur when there is no suitable alternative. During prefield layout of roads and harvest units, estuarine buffers were avoided. The Control Lake Project has no proposed roads or timber harvest within the buffer, which eliminates any direct effects to the estuarine zone. Sediment from road construction and mass wasting that enters streams is eventually delivered to the estuarine zone. As discussed below in the sediment section, the amounts of such sediment are considered to be minimal. In addition, estuaries are natural deposition zones for fine-grained sediments and all aquatic organisms are adapted to this process. The small amounts of extra sediment that will be delivered because of road construction and timber harvest would have minimal biologic effects and would not adversely affect biotic populations.

Floodplains

The high density of streams in the Project Area precludes avoiding all floodplains during timber-harvest-related activities. Environmental consequences in floodplains are generally limited to road construction during which both direct and indirect impacts to floodplains could occur. To minimize adverse effects on floodplains, all stream crossings have bridges and culverts sized so as not to impede floodwater. Consequently, there should be no loss of floodplain function. There will be no human occupancy of floodplains. The only floodplain development proposed in the Project Area is stream crossings. Table 4-7 shows the number of road crossings of Class I stream floodplains by watershed for the alternatives. Road crossings of Class I stream floodplains range from 39 for Alternative 12 to 10 for Alternative 10. Steelhead Creek watershed has 5 to 6 Class I crossings in all alternatives. Goose Creek and Shinaku Creek are the only other watersheds with crossings in all alternatives. The unnamed watershed adjacent to Elevenmile Creek (DO8A) has 7 crossings in Alternatives 11 and 12.

Table 4-7

Number of Floodplain Road Crossings of Class I Streams by Alternative[1/]

Watershed	Watersheds	Alt. 10	Alt. 11	Alt. 12
Hatchery Creek	C20D	0	0	0
Logjam Creek	C21C	0	2	6
North Thorne River	C49B.27	0	0	0
Goose Creek	C49B.10	1	4	4
Control Creek	C49B.20,.24,.25,.26	0	4	5
Rio Beaver Creek	C49B.21	2	1	2
Rio Roberts Creek	C49B.22	0	1	1
Upper Thorne River	C49B.23	0	0	4
Paul Young Creek	C72A	1	1	1
Steelhead Creek	C95B	5	6	6
Shinaku Creek	D03B	1	3	3
103-60-05	D08A.01	0	7	7
Elevenmile Creek	D09A.01	0	0	0
Nossuk River	D12A.01	0	0	0
TOTAL		10	29	39

1/ Unlisted watersheds do not have floodplain crossings.

Riparian Management Areas

Control Lake harvest unit reconnaissance and flagging were conducted following the standards and guidelines of the TLMP Draft Revision Supplement (1991a), but were generally consistent with the 1997 TLMP. In order to demonstrate how closely the preliminary layout corresponds with the 1997 TLMP, Table 4-8 shows the number of RMA acres that would be harvested under the current layout. Note that the Class III RMA acres are an overestimate because they include both Class III and IV streams. Discrepancies can be corrected during final layout. No timber harvest will occur within the 100-foot minimum TTRA buffers of Class I streams. The largest harvest acreage within the Riparian Management Area is for Class III/IV streams. Note that this category is also overestimated because the unit maps sometimes do not show narrow buffers along Class III/IV streams even though they are called out in the prescriptions. Alternative 12 has the largest number of acres of harvest within the Riparian Management Area, followed by Alternatives 11 and 10, in that order.

Table 4-8
Riparian Management Area Harvested by Stream Class and Watershed (in Acres)

		Alternative 10						
Name	Watershed	Class I Stream	Class II Stream	Class III[1/] Stream	Lake	Riparian Soils	MMI4	Total
Unnamed	000Z	0	0	0	0	0	0	0
Unnamed	BT9A	0	0	0	0	0	0	0
103-70-03	BW1A	0	0	0	0	0	0	0
103-80-56	BW2A	0	0	0	0	0	0	0
Hatchery Creek	C20D	0	0	0	0	0	0	0
Logjam Creek	C21C	0	0	0	0	0	0	0
Unnamed	C26C	0	0	0	0	0	0	0
North Thorne River	C45D,C49B.2700	0	0	0	0	0	0	0
Unnamed	C49B.0001	0	0	0	0	0	0	0
Goose Creek	C49B.10,.11,.12	+[2/]	0	1	+	0	0	1
Control Creek	C49B.20,.24,.25,.26	0	0	0	+	0	0	+
Rio Beaver	C49B.2100	2	+	24	0	0	0	26
Rio Roberts	C49B.2200	0	0	3	0	0	0	3
Upper Thorne River	C49B.2300	0	0	0	0	0	0	0
Paul Young Creek	C72A	0	0	0	0	0	0	0
Anderson Creek	C73C	0	0	0	0	0	0	0
Black Bear Creek	C93A	0	0	0	0	0	0	0
Steelhead Creek	C95B	5	1	37	0	+	0	43
Election Creek	C96A	0	0	0	0	0	0	0
Staney Creek	C97C,C99C,B59C	0	0	0	0	0	0	0
Shinaku Creek	D03B	0	4	27	0	0	0	31
103-60-05	D08A	0	0	0	0	0	0	0
Elevenmile Creek	D09A	0	0	0	0	0	0	0
Goodrow Creek	D10A	0	0	0	0	0	0	0
Nossuk River	D12A.01	0	0	0	0	0	0	0
Unnamed	D12A.0001	0	0	0	0	0	0	0
Unnamed	D14A	0	0	0	0	0	0	0
Unnamed	D15A	0	0	0	0	0	0	0
James Creek	D16A	0	0	0	0	0	0	0
TOTAL		7	5	92	+	+	0	105

1/ Includes Class III and some Classs IV streams identified in harvest units; uses Class III RMA widths for both classes.

2/ + Represents less than 0.5 acre.

Table 4-8 (continued)

Riparian Management Area Harvested by Stream Class and Watershed (in Acres)

		Alternative 11						
Name	Watershed	Class I Stream	Class II Stream	Class III[1/] Stream	Lake	Riparian Soils	MMI4	Total
Unnamed	000Z	0	0	0	0	0	0	0
Unnamed	BT9A	0	0	0	0	0	0	0
103-70-03	BW1A	0	0	0	0	0	0	0
103-80-56	BW2A	0	0	0	0	0	0	0
Hatchery Creek	C20D	0	0	0	0	0	0	0
Logjam Creek	C21C	1	0	0	4	0	0	5
Unnamed	C26C	0	0	0	0	0	0	0
North Thorne River	C45D,C49B.2700	1	0	0	5	0	0	6
Unnamed	C49B.0001	+[2/]	0	0	0	3	0	3
Goose Creek	C49B.10,.11,.12	2	0	2	4	0	0	8
Control Creek	C49B.20,.24,.25,.26	1	+	24	0	0	0	25
Rio Beaver	C49B.2100	3	+	39	0	0	0	42
Rio Roberts	C49B.2200	1	+	2	0	0	0	3
Upper Thorne River	C49B.2300	0	0	23	0	+	0	23
Paul Young Creek	C72A	0	0	0	0	0	0	0
Anderson Creek	C73C	0	0	0	0	0	0	0
Black Bear Creek	C93A	0	0	0	0	0	0	0
Steelhead Creek	C95B	6	3	57	0	+	0	66
Election Creek	C96A	0	+	8	0	0	0	8
Staney Creek	C97C,C99C,B59C	0	0	0	0	0	0	0
Shinaku Creek	D03B	1	7	92	0	0	0	100
103-60-05	D08A	2	+	12	0	0	0	14
Elevenmile Creek	D09A	0	0	0	0	0	0	0
Goodrow Creek	D10A	0	0	0	0	0	0	0
Nossuk River	D12A.01	+	0	6	0	0	0	6
Unnamed	D12A.0001	0	0	0	0	0	0	0
Unnamed	D14A	0	0	0	0	0	0	0
Unnamed	D15A	0	0	0	0	0	0	0
James Creek	D16A	0	0	0	0	0	0	0
TOTAL		17	10	265	9	8	0	309

1/ Includes Class III and some Classs IV streams identified in harvest units; uses Class III RMA widths for both classes.

2/ + Represents less than 0.5 acre.

Table 4-8
Riparian Management Area Harvested by Stream Class and Watershed (in Acres)

		Alternative 12						
Name	Watershed	Class I Stream	Class II Stream	Class III[1/] Stream	Lake	Riparian Soils	MMI4	Total
Unnamed	000Z	0	0	0	0	0	0	0
Unnamed	BT9A	0	0	0	0	0	0	0
103-70-03	BW1A	0	0	0	0	0	0	0
103-80-56	BW2A	0	0	0	0	0	0	0
Hatchery Creek	C20D	0	0	0	0	0	0	0
Logjam Creek	C21C	1	+	1	4	0	0	6
Unnamed	C26C	0	0	0	0	0	0	0
North Thorne River	C45D,C49B.2700	1	0	0	5	0	0	6
Unnamed	C49B.0001	+[2/]	0	0	0	3	0	3
Goose Creek	C49B.10,.11,.12	2	0	2	4	0	0	8
Control Creek	C49B.20,.24,.25,.26	1	+	24	+	0	0	25
Rio Beaver	C49B.2100	4	1	39	+	2	0	46
Rio Roberts	C49B.2200	1	+	2	0	0	0	3
Upper Thorne River	C49B.2300	1	+	35	0	+	0	37
Paul Young Creek	C72A	0	0	0	0	0	0	0
Anderson Creek	C73C	0	0	0	0	0	0	0
Black Bear Creek	C93A	0	0	0	0	0	0	0
Steelhead Creek	C95B	6	3	62	0	+	0	71
Election Creek	C96A	0	+	8	0	0	0	8
Staney Creek	C97C,C99C,B59C	0	0	0	0	0	0	0
Shinaku Creek	D03B	1	7	92	0	0	0	100
103-60-05	D08A	2	+	25	0	3	0	30
Elevenmile Creek	D09A	0	0	0	0	0	0	0
Goodrow Creek	D10A	0	0	0	0	0	0	0
Nossuk River	D12A.01	+	0	6	0	0	0	6
Unnamed	D12A.0001	0	0	0	0	0	0	0
Unnamed	D14A	0	0	0	0	0	0	0
Unnamed	D15A	0	0	0	0	0	0	0
James Creek	D16A	0	0	0	0	0	0	0
TOTAL		20	12	296	14	9	0	351

1/ Includes Class III and some Classs IV streams identified in harvest units; uses Class III RMA widths for both classes.

2/ + Represents less than 0.5 acre.

Shinaku Creek (D03B) has the largest number of acres of potential harvest within the Riparian Management Area, under Alternatives 11 and 12, while Steelhead Creek (C95B) has the highest for Alternative 10.

Generally, the Riparian Management Area harvested within a watershed is widely distributed over many subwatersheds. Consequently, the potential impact to any Class I stream below the harvest units is small. For example, Shinaku Creek (D03B) has 1,836 acres of Riparian Management Area within a catchment of 16,590 acres with a maximum proposed harvest of 100 acres. This represents less than 1 percent of the Riparian Management Area in the watershed.

The effects of riparian area harvest relate to water quality, and fish and wildlife habitat. Consequently, the effects of Riparian Management Area harvest is discussed in more detail in the *Water, Fish, and Fisheries*, and *Wildlife* section.

Mitigation

Wetlands, Floodplain, Riparian Management Area

Mitigation measures designed to protect wetland areas involved, to the extent possible, the avoidance of muskegs during office planning and field reconnaissance. Additionally, in some cases, suspension is required during logging and wetland buffers for wildlife are prescribed. Field layout of road systems allowed site-specific identification of small drainages in wetlands requiring culverts and the road segments requiring additional culverts and permeable subgrades to maintain water circulation. Culverts and permeable subgrade materials are required when roads cross wetlands; these road segments are identified on the road design cards. Additionally, the use of BMP's in both construction and maintenance ensures that flows, circulation patterns, and chemical and biological characteristics of the wetlands' water would be minimally impaired. Implementation of these procedures are required to maintain the physical and chemical functions of wetlands (EPA, 1993; USDA Forest Service, 1995a).

Floodplains will not be harvested because they are part of the riparian buffer of Class I streams. Road systems, however, will cross floodplains. To minimize adverse effects, the frequent placement of culverts and bridges is indicated on the Road Cards. These culverts and bridges prevent the road prism from inhibiting the flow of floodwaters (EPA, 1993).

Mitigation measures designed to protect riparian areas are based on TLMP Draft Revision standards and guidelines (USDA Forest Service, 1991a), the Riparian Management Area definition, the associated planning level buffer prescriptions (see *Appendix D* of the Draft EIS), and the site-specific buffers prescribed in the field. The prescription of buffers in the field is the most important mitigation measure because it ensures the location and evaluation of all streams in the harvest units. This field verification identified all Class I streams and Class II streams and prescribed the appropriate buffer (Mitigation Measure F5). This procedure allowed the avoidance of the riparian area adjacent to previously unknown Class I and II streams. Additionally, field verification allowed the identification of numerous previously unmapped Class III and IV streams and prescribed directional falling and split yarding of trees away from the stream (Mitigation Measure F6). In some cases, buffers were prescribed for Class III streams because of the presence of deep soils along steep V-notches which could contribute sediment to the stream. The unit cards identify which mitigation measures apply to each harvest unit.

Under the 1997 TLMP Revision, standards and guidelines may require wider buffers in some cases. In those cases, the wider buffers would be implemented during final layout.

Buffers for Class I and Class II streams are susceptible to blowdown after harvest. Prevention and minimization of blowdown was developed using techniques described in the Southeast Alaska Guide for Reducing Wind Damage (Harris, 1989). The applied techniques use unit boundaries and harvest types, which incorporate partial retention around the unit perimeter, to reduce risk. The Ketchikan Area is currently monitoring blowdown in stream buffers to determine the effectiveness of the buffers and other techniques (USDA Forest Service, 1992f). One function of no-harvest buffers on Class I streams is to maintain the supply of large woody debris to the stream. Windthrow is the most common source of natural large woody debris loading (Gregory and Ashkenas, undated). Consequently, the blowdown of portions of buffer strips merely changes the timing of debris input (Gregory and Ashkenas, undated). Catastrophic blowdown of long lengths of buffer on Class I streams could reduce long-term input of LWD. If catastrophic blowdown creates a detrimental condition, e.g., barriers to anadromous fish, modification of the debris accumulation should be considered on a case-by-case basis.

Stream buffer and BMP information tabulated from field verification are shown in Tables 4-9 and 4-10. Table 4-9 summarizes information on the length of 100-foot TTRA and extended width stream buffers by stream class and alternative. Table 4-10 summarizes information on the lengths of Class III streams that would be harvested to streambank and that received a no-harvest buffer. Note that the values in these tables can double-count a stream length depending on its location in a unit. For example, a Class I stream that forms a unit boundary would receive a buffer only on one side, while a Class I stream within a unit would receive a buffer on both sides.

Table 4-9
Lengths (in Miles) of Stream Buffer on Class I and II Streams

	100-foot TTRA Buffer		Extended Width Buffer	
	One-Sided	Two-Sided	One-Sided	Two-Sided
Alternative 10				
Class I	4.6	0.4	0.8	0.0
Class II	1.7	1.1	0.1	1.0
Alternative 11				
Class I	14.4	1.0	4.3	0.0
Class II	6.0	0.9	1.6	0.5
Alternative 12				
Class I	20.4	1.2	7.4	0.0
Class II	6.1	1.8	1.8	0.5
Total Project Area	**Class I miles**	**434.8**		
	Class II miles	**200.1**		

For Class I and II streams, most of the buffers applied are for one side of the stream. For example, in Alternative 12 there are 20.4 miles of one-sided buffers for Class I and 6.1 miles of one-sided buffers for Class II streams. These values indicate that for the most part, planned timber harvest units utilized Class I and II streams as unit boundaries rather than including them within the harvest units. Only 1.2 miles of two-sided Class I stream buffers and 1.8 miles of two-sided Class II stream buffers would be applied in Alternative 12. Alternatives 10 and 11 have similar ratios of one-sided to two-sided buffers.

For Class III streams, applied one-sided buffer lengths range from 12.3 miles for Alternative 12 to 3.5 miles for Alternative 10 (Table 4-10). Two-sided buffer lengths range from 18.1 to 10.7 miles for Alternatives 12 and 10, respectively (Table 4-10). The amount of total Project Area Class III stream length affected would range from 2 to 5 percent. These percentages represent overestimates because of the higher density of Class III streams mapped in harvest units due to ground verification.

Cumulative Effects

The estimation of cumulative effects for the Project Area assumes that the level of harvesting would remain relatively constant over the rotation period of 100 years. Cumulative effects of these actions on wetlands, floodplains, and riparian areas would then be proportional to the level of harvest and road building that occurred on wetlands, the amount of road building over floodplains, and the amount of timber harvest in Riparian Management Areas.

The cumulative effects of this harvest to forested wetlands is anticipated to be minimal. Revegetation of forested wetland sites occurs in the same timeframe as other forested sites, usually within 3 to 5 years. Consequently, long-term effects to forested wetlands are expected to be minor. Since growth rates on forested wetlands are expected to be lower than on nonwetland forest sites, merchantable timber from these acreages may not be available in a 100-year rotation.

Road construction on wetland sites will use culverts to minimize disruption of water flow and permeable subgrade materials to avoid restricting the natural movement of water. These measures will ensure that the hydrological, chemical, and biological functions of wetlands would be minimally impaired. The roadbed overlying wetlands will remove the area from production and eliminate their biological functions.

Cumulative effects on floodplains will be minimal. Future timber harvest on floodplains is not anticipated to occur. Road building on floodplains will occur. Proper road location, and bridge and culvert design will minimize the effects on flooding and hydrologic connectivity of the floodplain and river system.

In future entries, timber harvest in Riparian Management Areas will likely occur at levels similar to the proposed entry in the Control Lake Project. Riparian Management Areas along Class I and II streams will receive no timber harvest within 100 feet (or more) of the stream banks, which should produce minimal effects. Class III Riparian Management Areas will receive some level of harvest on a site-specific basis. Over time there will be a small reduction in the amount of LWD supplied to Class III streams within individual watersheds because LWD is supplied predominantly by older forests. This reduction may affect Class I and II streams that occur lower in the drainage basin though this effect is not documented (see discussion under Fish Habitat in the *Water, Fish, and Fisheries* section).

Cumulative effects on floodplains will be minimal. Future timber harvest on floodplains is not anticipated to occur. Road building on floodplains will occur. Proper road location, and bridge and culvert design will minimize the effects on flooding and hydrologic connectivity of the floodplain and river system.

In future entries, timber harvest in Riparian Management Areas will likely occur at levels similar to the proposed entry in the Control Lake Project. Riparian Management Areas along Class I and II streams will receive no timber harvest within 100 feet (or more) of the stream banks, which should produce minimal effects. Class III Riparian Management Areas will receive some level of harvest on a site-specific basis. Over time there will be a small reduction in the amount of LWD supplied to Class III streams within individual watersheds because LWD is supplied predominantly by older forests. This reduction may affect Class I and II streams that occur lower in the drainage basin though this effect is not documented (see discussion under Fish Habitat in the *Water, Fish, and Fisheries* section).

The increased percentages of harvested Class III Riparian Management Area within drainage basins will also slightly increase the risk of debris torrents as LWD decays as well as the delivery of streamside sediment to downstream reaches. Field identification of such stream channels and implementation of site-specific BMP's for buffering or directional felling will reduce, though not eliminate, these effects.

Monitoring

Routine implementation monitoring will be conducted by the timber sale administrator and road inspectors, who will be primarily responsible for ensuring the implementation of procedures specified on the unit and road cards. Culverts, permeable subgrade materials, buffers, and controlled felling and yarding of trees away from streams are the BMP's designed to protect wetlands, floodplains, and riparian areas.

Water, Fish, and Fisheries

Key Terms

Alevin—newly hatched salmon that are still attached to the yolk sac.
Anadromous—fish that ascend from the sea to breed in freshwater streams.
Aquatic Habitat Management Unit (AHMU)—areas for managing the resources associated with streams and lakes.
Best Management Practices (BMP's)—land management methods, measures or practices intended to minimize or reduce water pollution.
Channel types—the defining of stream sections based on watershed runoff, landform relief, and geology.
Estuary—relatively flat, intertidal, and upland areas where saltwater meets fresh water, as at the heads of bays and the mouths of streams.
Large woody debris (LWD)—any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than 1 meter that intrudes into a stream channel; also called Large Organic Debris (LOD).
Management Indicator Species (MIS)—species whose population changes are believed to best indicate the effects of land management activities; fish MIS in the Polk Inlet Project Area are coho and pink salmon and Dolly Varden char.
Mitigation—measures designed to counteract environmental impacts or to make impacts less severe.
Resident fish—nonmigratory fish that complete their entire life cycle in fresh water.
Salmonid—refers to the group of fishes to which salmon belong.
Sediment—water-transported earth materials.
TTRA Buffers—a no-harvest zone at least 100 feet in width on each side of all Class I streams and Class II streams which flow directly into a Class I stream.
V-notch—a deeply incised, narrow valley along a drainage with a characteristic "V" shaped cross-section.
Watershed—area that contributes runoff water to a waterway.

Direct and Indirect Effects to Water Resources

Effects to water resources are discussed below in regard to hydrology, water quality, and consumptive water uses.

Water Resources Hydrology

Timber harvest alters basin hydrology because it affects transpiration, the interception and evaporation of rainfall, snow accumulation and melt, and soil structure and resultant water infiltration and subsurface transmission rates (MacDonald, 1991). Though changes in stream flow are expected, their direction and magnitude vary and specific effects are not easily predicted. Generally, the larger the percentage of a watershed harvested, the greater the effects on stream flow. In some studies, a harvest of approximately 25 to 35 percent of basin area is required within a period of 5 to 15 years before effects on mainstem flow are noted (Rothacher, 1970, 1973; Harr et al., 1979; Duncan, 1986). A study of the response of the Maybeso watershed on Prince of Wales Island to timber harvest showed no significant changes in stream flow when 25 percent of the basin was harvested (James, 1956; Meehan et al., 1969). An analysis of the Staney Creek basin on Prince of Wales Island showed increases in mean and summer low flows (base flow) when harvest reached between 20 to 25 percent of the basin area (Bartos, 1989).

Though timber harvest has generally been shown to produce increases in streamflow, Hicks et al. (1991) present long-term data from central Oregon that shows decreases in flow during summer low flow periods. In a completely harvested, 237-acre watershed, water yield increased above that of a control watershed for approximately 8 years. For the next 19 years of record, late summer water yield decreased below that of the control watershed. Hicks et al. (1991) consider this decrease to be due to the dominance of alder in the riparian zone because the alder produced an increase in transpiration over that of conifer-dominated vegetation. In the same study, a 25 percent patch-cut, 249-acre watershed showed increases in late summer water yield for 16 years after harvest, returning to preharvest levels for the next 10 years of record. Besides the smaller percentage of harvest, the riparian zone of this watershed was not dominated by alder after harvest (Hicks et al., 1991).

Rapid melting of shallow snowpack by rainstorms can result in higher rates of water input to soil and streams than would occur during rainstorms alone. The elevational range over which snow might accumulate and melt, perhaps several times in one season, is known as the transient snow zone. Studies in Oregon, Washington, and southwestern British Columbia show that timber harvest in the transient snow zone could increase the magnitude and peaks of winter runoff (Harr, 1986; Harr et al., 1989; Golding, 1987).

Although timber harvest usually increases runoff and peak flows, Cheng (1988) documented the opposite effect in southern British Columbia. In that case, logging had compacted the soil, delayed water infiltration, and slowed water transmission through soil macropores.

Stream flow increases from timber harvest which could significantly affect sediment transport cannot be accurately predicted with the information available. Cumulative watershed areas harvested with this entry range from 0 to 35 percent with 17 percent being the maximum percentage associated with Control Lake Project units (see *Cumulative Effects* section). Effects are expected to be greater in small catchments in which harvest units make up a proportionally larger amount of the watershed. In all alternatives, watersheds BT2A, Logjam Creek, Goose Creek, East Goose Creek, Steelhead Creek (C95B), and Election Creek (C96A) have percentage harvests near or greater than 15 percent. Though these harvest levels are below documented thresholds these basins may experience low to moderate increases in stream discharge quantities.

Decreases in late summer low flows are not anticipated from the harvesting that occurs during this entry in the Project Area. Harvest levels of 100 percent of a watershed at one entry, such as the harvest that produced the low flows documented by Hicks et al. (1991), will not occur. Harvest rates are restricted to 35 percent of a 15-year period and most watersheds are not near the upper threshold (see *Cumulative Effects* section). In addition, alder domination of regrowth tends to occur on floodplains sites where ground disturbance allows its seeds to germinate on bare mineral soil. Floodplains are predominantly associated with Class I, and to a lesser extent with Class II, streams. The placement of 100-foot buffers (minimum) on Class I and most Class II streams, reduces the chance for alder establishment on floodplains. Alder does not dominate the riparian zone of Class III streams. Late summer low flows may be reduced in watersheds that were harvested prior to the establishment of Standards and Guidelines which prohibit harvest on floodplain soils. These effects might occur in the watershed of Steelhead Creek, Election Creek, and Goose Creek which have floodplains with a significant alder component. Because Southeast Alaska has a higher precipitation regime and lower summer air temperatures than central Oregon, effects in this region are expected to be less. Alder can become established in the riparian zone of Class III streams after timber harvest if mineral soils are exposed. Present buffers and yarding specifications for Class III streams are sufficient to maintain ground cover soil quality standards that will prevent or minimize alder domination of these sites.

Water Quality

Water quality is discussed in regard to stream sediment, water chemistry, stream temperature and dissolved oxygen, and consumptive use. The proposed action would no longer result in a continued supply of raw wood products to the KPC pulp mill at Ketchikan. This pulp mill, which affected water quality at Ward Cove in the vicinity of Ketchikan, is now closed.

Stream Sediment

Harvest Units

Two approaches were taken to estimate surface erosion. First, the amount of soil disturbance was estimated based on logging method. The acreage harvested by each method was tabulated for each watershed. Based on the percent disturbance for each type of logging, the total area disturbed per watershed was summed. The acres of potential soil disturbance are shown in Table 4-2.

The second approach evaluated the potential delivery to streams of sediment generated in harvest units. Stream proximity and topography were used to evaluate potential delivery. A steep unit crossed by several streams has a high delivery potential, while a flat unit with no nearby streams has a very low delivery potential. Two relative ranking systems were used; one to evaluate each unit's connection to streams, and a second to evaluate what happens to the sediment once it reaches the stream. Streams that have low transport capability may be highly affected by sediment and received a high rating. Streams with a high transport capacity are less affected by sediment and receive a low rating. Descriptions of the various classes in both ranking systems is given in the Control Lake Project Soils Resource Report (Jackson, 1995). The deliverability values were multiplied times the transport capability values to estimate the total hazard to the stream; thus if there was no deliverability, but high susceptibility, the result would be zero. The total hazard was summed for each watershed. Table 4-11 shows that Alternative 12 has the highest potential, while Alternative 10 has the lowest potential for sediment effects.

Table 4-11
Sediment Delivery Potential of Harvest Units for the Alternatives

	Alternative 10	Alternative 11	Alternative 12
Sediment Delivery Index[1/]	181	546	652

1/ This index was developed based on such factors as the number of streams, proximity to Class I streams, slope steepness, sediment potential, and logging system. Each unit was ranked and results tabulated. Details of this procedure are contained in Jackson 1995 and Rogers and Ablow 1995.

In general, surface soil erosion that occurs within timber harvest units has a limited possibility for contributing sediment to streams. The main BMP's to minimize soil disturbance near Class III streams are buffers, controlled felling of trees away from streams, and yarding these trees away from the streams (split yarding). Site-specific recommendations for controlled felling and split yarding are contained in the unit cards.

Road Erosion

Construction of new roads and reconstructing old roads exposes cutbank soil and roadbed materials to erosion which increases sediment delivery to streams. The largest component of management-caused sediment input to streams is from roads (Reid and Dunne, 1984). Specific quantities of sediment cannot be predicted; consequently, three methods are used to evaluate the alternatives and their relative risk of sediment delivery to streams. First is the acres of new road proposed. Second is the number of proposed road crossings of streams. Third is an evaluation of the specific potential for sediment delivery to streams of all harvest units and roads.

Table 4-3 shows the acres of new road proposed by major watershed including quarries and landings. Watersheds with the highest road acreage have the greatest susceptibility for potential road-related sediment delivery. This table shows that Alternative 12 has the highest acres of new roads followed by Alternatives 11 and 10. Steelhead Creek, Rio Beaver, and Watershed DO8A (adjacent to Elevenmile Creek) have the largest area (over 100 acres) of proposed new roads under Alternative 12. By converting road area to a percentage of each watershed area, the relative magnitude can be evaluated independent of watershed size. For these three watersheds, the percentage area of new roads under Alternative 12 would be 0.8, 1.2, and 1.6 percent of the total watershed acreage, respectively.

Standards and Guidelines do not define a maximum percentage of a watershed that may be converted to a roaded condition. A study by Cederholm et al. (1981) showed that fine sediments began to accumulate in downstream spawning gravels when logging roads in their study area on the Olympic Peninsula in Washington State exceeded 2.5 percent of the basin area. However, these effects were directly attributed to older roads (in that case, built before 1972) constructed without BMP's such as end hauling road cut materials on steep slopes, grass seeding cut and fill areas, and energy dissipation structures at culvert outfalls. Such BMP's are specified in Forest-wide Standards and Guidelines on the Tongass National Forest and will significantly reduce the road related risk to water quality. Higher percentages of roaded acres for a given watershed, however, do indicate a higher risk of impact from roads. Consequently, BMP implementation in these watersheds is especially important. Older roads occur in the Project Area; in these areas on-going road maintenance is important.

The number of road stream crossings is shown in Table 4-12. These data show that Alternative 12 has the highest total number of crossings (258 or a little less than three stream crossings per mile of road), and the highest potential risk of sediment delivery to streams. In Alternative 12, Shinaku Creek and Steelhead Creek have the highest number of road crossings (54 and 73, respectively). In Alternative 11, Shinaku Creek still has 54 crossings while Steelhead Creek has 72 crossings. Alternative 10 has the fewest total stream crossings.

Table 4-12
Number of Road Crossings of Class I, II, and III/IV Streams by Alternative

	Alternative 10	Alternative 11	Alternative 12
Class I	10	29	39
Class II	19	37	43
Class III/IV	54	153	176
Total	**83**	**219**	**258**

The results of a potential sediment delivery analysis for roads is shown in Table 4-13. This methodology utilizes a ranking system based on road usage and watershed characteristics. The methodology is based on that developed by Hogan and Wilford (1989) and detailed in Jackson (1995) and Rogers and Ablow (1995). The method considered stream crossings and road usage which is related to harvested timber volume. The number of road-stream crossings is multiplied by 1, 17, and 130 depending on whether the expected logging truck usage is light, medium or heavy. These numbers are based on the relative magnitudes of road bed sediment production documented by Reid and Dunne (1984) where heavy usage was considered five or more loaded logging trucks per day. Results by alternative are presented in Table 4-13; results for individual subwatersheds are presented in Appendix D of the Draft EIS and in the planning record. These values provide an index of the relative risk of impacting water quality or increasing the amount of fine sediment in gravel above natural levels. Alternative 12 has the highest potential for sediment delivery to streams, followed by Alternatives 11 and 10, in that order.

Table 4-13
Sediment Delivery Potential of Roads by Alternative

	Alternative 10	Alternative 11	Alternative 12
Sediment Delivery Index 1/	6,728	10,119	13,940

Source: Jackson, 1995.

1/ This index was developed based on the number of stream crossings and assumed truck traffic. Each road segment was ranked and the results tabulated. Details of the procedure are contained in Jackson, 1995 and Rogers and Ablow, 1995.

The values indicated in Table 4-13 and Appendix D of the Draft EIS reflect both the length of high-use roads and a relatively high stream drainage density. The maximum tabulated values shown for individual subwatersheds (Appendix D of the Draft EIS are high). These values show the relative risk of impact by subwatershed; they do not, however, indicate actual sediment delivery to streams. The high values are reached because of the number of anticipated loaded logging trucks passing streams and generating potentially deliverable fine sediment. In cases where these loaded trips exceed four trips daily, each trip past each stream was multiplied by 130 and then totalled (Jackson, 1995). Once fine sediment is mobilized on the road bed it can be delivered to roadside ditches, carried to a stream, and degrade water quality. Minimizing this sediment delivery is of fundamental importance in road location and design, BMP implementation, and road maintenance. The following discussion evaluates the risk values in terms of the potential sediment delivery volume which is what affects water quality.

The 1, 17, and 130 multipliers are based on the relative proportion of fine sediment produced at Reid and Dunne's (1984) study sites under increasing road usage; the values are not based on the absolute amount of fine sediment delivered from the road to the stream. In their study area, heavy road use potentially generated 915 tons per mile per year of fine sediment. Seventy-five percent of the roadside ditches contributed sediment to streams. These relationships suggest that under heavy road use for one full year there would be 685 tons of sediment delivered to a stream receiving drainage from 1 mile of road. Average cross-drain culvert spacing, which minimizes the amount of water and sediment delivered to a stream, was greater than 500 feet (Reid and Dunne, 1984).

For comparison, in a similar study of the Polk Inlet area on Prince of Wales Island, Kahklen (1994) documented 15 tons per mile per year of fine sediment production from heavy road usage (six to eight loaded logging trucks per day). This value shows that with similar use

approximately 60 times less sediment is produced at the Polk Inlet study site than at the Olympic Peninsula site. Kahklen (1994) indicated that about 35 percent of the roadside ditches in Polk Inlet drained to a stream; approximately 45 percent less than the roadside ditch delivery at Reid and Dunne's (1984) study site. In the Polk Inlet area culvert spacing averaged 150 to 300 feet, partially explaining the reduced drainage to stream channels. Consequently, the volume of potential yearly sediment delivery to streams documented by Kahklen (1994), under similar road usage, is approximately 130 times smaller than the values documented by Reid and Dunne (1984). This comparison suggests that even watersheds with high values of potential sediment delivery (such as C49B.2100) are at a lower risk than indicated by the values alone.

The comparative values discussed above highlight the importance of implemented BMP's in minimizing effects to stream channels (USDA Forest Service, 1995a). Data presented in USDA Forest Service (1995a) for the Old Franks drainage in the Polk Inlet Project Area on Prince of Wales Island show that only 4 out of 206 culverts (2 percent of the total), were not fulfilling their cross-drain function. BMP's implemented at this level of effectiveness will significantly reduce the potential for sediment delivery to streams and related water quality degradation. Additionally, in the higher elevations in Southeast Alaska actual road use by logging trucks occurs for only about 8 months, rather than all year long (as in lower elevations), further reducing the absolute amount of sediment delivery to streams.

Documented rates of sediment delivery when timber harvest includes use of BMP's (Mitigation Measures F2, F5, F6, F7, F8) are within the range of normal baseline conditions of streams in Southeast Alaska (Paustian, 1987). The use of road BMP's (Mitigation Measures F2, F8, F10) are similarly expected to reduce the impact of sediment eroded from roads. For example, in a review of North American forestry practices, Binkley and Brown (1993) conclude that while use of BMP's may not prevent an increase in erosion, their use kept increases of sediment concentration to a minimum. Consequently, sediment delivery to streams in the Project Area is expected to be within state standards.

Water Chemistry

Significant alterations to water chemistry as a result of timber harvest are not expected. The use of motor vehicles and motor-driven timber harvest equipment means there is potential for fuel spills which might reach streams. Seeding and fertilizing road cutslopes for erosion control may allow the influx of fertilizer to stream systems. Under normal operating conditions, these nontimber harvest actions are expected to have only a minor potential to affect water quality, and water quality standards will not be exceeded.

Stream Temperature and Dissolved Oxygen

Timber harvesting in Class III riparian areas is expected to have minimal effects on stream temperature and dissolved oxygen. The maintenance of minimum 100-foot buffers on Class I and most Class II streams should substantially mitigate the downstream effects of any stream temperature increases occurring in the Class III streams. Stream temperatures in the Project Area seldom exceed the State standard of a maximum 68°F. The effects of removing a small area of streamside vegetation are generally negligible. Lower elevation streams with a southerly aspect would experience greater temperature changes than higher elevation streams with a northerly exposure. Significant decreases in dissolved oxygen because of increased stream or lake temperatures are not expected. The application of appropriate stream buffers and other BMP's would maintain sufficient stream and lake canopy closure and mitigate any potential for significant temperature increases (see *Mitigation* section).

Lakes generally serve to buffer stream temperature extremes, with their effectiveness dependent on lake bathymetry and size and stream flux entering and exiting the lake. The numerous lakes in the Project Area may affect how stream temperatures respond to harvest activities. Information presented in the Chapter 3, *Water, Fish, and Fisheries* section demonstrates the increased temperature of lakes compared to Class I streams. These measurements were made at the shallow surface of lake edges and probably overestimate lake temperatures.

Addition of organic material which increases the biological oxygen demand and reduces the dissolved oxygen availability should be mitigated by buffers along Class I and II streams. BMP's for Class III streams which include split yarding limits the amount of organic material entering the stream, while the high gradient and associated turbulence of many Class III streams adds oxygen to the water, reducing the negative impact of increased organic input above natural levels.

The potential effects on stream temperature were evaluated by considering the miles of vegetation removed alongside Class III/IV streams in all timber harvest units (Table 4-10). These data quantify the total amount of stream channel subject to increased insolation and warming.

Vegetation removal along Class III/IV streams ranges from 48.5 miles for Alternative 12 to 24.9 miles for Alternative 10 (Table 4-10). The Shinaku Creek, Upper Thorne River, and Steelhead Creek watersheds have the most vegetation removal, while no vegetation would be removed in several watersheds. The affected miles compares to 585 total miles of Class III and IV streams in the Control Lake Project Area (see Table 3-8) and is dispersed throughout watersheds. Most Class III and IV streams in the Project Area are high gradient, contained channels with low temperatures even in summer. These properties make them resistant to thermal increases. For all of these reasons, stream temperature increases from removal of streamside vegetation along Class III and IV streams in harvest units are unlikely. Class I and II streams all have a minimum 100-foot buffer along both stream banks which will prevent increases in water temperature. Units with potentially temperature sensitive streams are discussed below in the Mitigation section.

Consumptive Water Use

Timber harvest would not have any impact on the availability of water to those sites in the Project Area where local consumptive water use occurs. No harvest is planned for the immediate vicinity of recreational sites on National Forest System lands. The Forest Service cabin on Lake Galea in the Honker Divide area is within a Scenic River LUD, where timber and road building activity is limited. Similarly, planned activities near the Control Lake cabin, Black Bear Lake cabin and Eagles Nest campground are not expected to affect water use.

Direct and Indirect Effects to Fish and Fisheries

Because of mitigative actions taken and planned for implementation, no anticipated significant impacts will occur to fisheries resources from any of the alternatives. The remaining environmental effects of timber harvest and road construction on fish and fisheries resources may be either direct, indirect, or cumulative. Actions that have effects on fish include removal of riparian vegetation, increased sediment inputs to streams, temperature and dissolved oxygen changes, changes in inputs of LWD, and miscellaneous actions related to road construction. All of the action alternatives have some associated risk of effects to streams and fisheries resources; the magnitude of risk is generally proportional to the extent of application of stream buffer prescriptions and BMP's, the miles of new or reconstructed road, and the number of stream crossings required.

Removal of Riparian Vegetation in the Riparian Management Area

The effects on fisheries from removal of riparian vegetation are small because the overall reduction in riparian vegetation in any area is small. Marked reduction of riparian vegetation can have several indirect adverse effects on fish resources, including reduction in LWD which is important for rearing fish habitat, increased sediment input causing reduced fish production, and altered stream temperature which influence survival and growth of fish in streams and lakes (see *Water, Fish, and Fisheries* section in Chapter 3). The buffers established under TTRA and expanded-width buffers mitigate most adverse effects to streams from riparian harvest for all alternatives. To evaluate the effects on harvest riparian areas on fisheries resources, several factors were considered, including: (1) miles of riparian habitat harvested (Tables 4-9 and 4-10); and (2) acres of riparian management area harvested (Table 4-8).

Within the harvest units, riparian harvest occurs to streambank only along Class III streams, which do not have fish. Total riparian management area harvest along Class III streams is highest in Alternative 12 and smallest in Alternative 10 (Table 4-8). Riparian management area harvest is greatest in the watershed for all alternatives. In all alternatives, the second highest level of harvest occurs in the Shinaku Creek watershed. Vegetation removal along Class III streams ranges from 48.5 miles for Alternative 12 to 24.9 miles for Alternative 10 (Table 4-10). The Shinaku Creek, Upper Thorne River, and Steelhead Creek watersheds have the most vegetation removal. The affected miles compares to 585 total miles of Class III streams in the Control Lake Project Area (see Table 3-7).

Sediment Inputs to Streams

Considering the protection built with TTRA and other expanded-width buffers and implementation of BMP's, none of the activities should significantly increase impacts to fisheries from increased sediment. However, risks from sediment still remain to these resources, with the highest risks occurring where the greatest proportion of near stream disturbance and, secondarily, watershed disturbance occurs (see Risks, this section).

Increased sediment delivery may directly or indirectly adversely affect the survival of salmonids by factors such as reduced egg survival in stream gravel, reduced food supply, and direct mortality (see *Water, Fish, and Fisheries* in Chapter 3). Sediment input is affected by quantity of road miles, number of stream crossings, slope, total harvest acres and riparian harvest acres. The effects of the alternatives on these factors are discussed above under Water Quality in this section and in the Chapter 4 *Wetlands, Floodplains, and Riparian Areas* section.

The number of stream crossings (bridges and culverts) is an index used to assess the potential for erosion and increased sediment inputs to streams. Table 4-12 shows the number of stream crossings, by stream class. Steelhead Creek watershed has the most stream crossings, making up a total of 73 for Alternative 12. Fifty-seven of these stream crossings occur on Class III/IV streams while only 6 stream crossings occur on Class I streams. Because there is no concentration of road crossings in one subwatershed, the affect of increased sediment into the stream should be low. For all alternatives, subwatersheds with a higher risk of road sediment delivery are: C21C.0405 (Logjam Creek watershed); C49B, C49B.0001, and C49B.2100 (Rio Beaver watershed); C49B.2403 (Control Creek watershed); and C49B.2701 (North Thorne River).

Removal of riparian vegetation is indicated in Table 4-8 by watershed. For all alternatives, the Thorne River, Control Creek, the Upper Thorne River, Steelhead Creek and Shinaku Creek watersheds have the largest acreage of riparian management area harvest and have the highest potential for sediment input to streams based on streamside activity.

Fish Habitat

The habitat capability models indicate a decrease in potential production after 1995 for Dolly Varden char, while increasing production for coho salmon and pink salmon (Tables 4-14, 4-15, and 4-16). Major increases in predicted production occur by 1991 and are the result of a fish passage facility installation in Rio Roberts (see *Water, Fish, and Fisheries* section in Chapter 3). However, pink salmon have not successfully utilized the fish passage; consequently, the model overestimates increases in pink salmon productivity. The reduction in potential in some VCU's (e.g., VCU's 577, 578, 595, 597) for Dolly Varden char and coho salmon over time is primarily the result of harvest that occurred between 1954 and 1979, not from the Control Lake Project. Timber harvest before 1980 included harvest in the riparian areas to the stream channel bank along anadromous and resident fish streams.

Table 4-14
Dolly Varden Char Habitat Capability from 1954 to 2145 by VCU

VCU	1954	1991	1995	2005	2115	2145
574	223,000	223,000	223,000	222,000	221,000	221,000
575	213,000	213,000	213,000	213,000	213,000	213,000
576	121,000	121,000	121,000	121,000	121,000	121,000
577	252,000	252,000	252,000	251,000	251,000	251,000
578	146,000	146,000	146,000	146,000	146,000	146,000
591	36,000	36,000	36,000	36,000	36,000	36,000
592	62,000	62,000	62,000	62,000	62,000	62,000
593	76,000	76,000	76,000	76,000	76,000	76,000
594	86,000	86,000	86,000	86,000	86,000	86,000
595	69,000	69,000	69,000	69,000	69,000	69,000
596	123,000	123,000	123,000	123,000	123,000	123,000
597	255,000	252,000	252,000	251,000	249,000	249,000
Total	1,663,000	1,660,000	1,659,000	1,657,000	1,653,000	1,654,000

Source: TLMP 1990 Habitat Capability Model.

Numbers also include production in lakes in each VCU.

Table 4-15
Coho Salmon Habitat Capability (Smolt Production) and Percent Change from 1954 to 2145 by VCU

VCU	1954	1991	1995	2005	2115	2145
574	41,000	41,000	41,000	41,000	41,000	41,000
575	44,000	44,000	44,000	44,000	44,000	44,000
576	36,000	54,000	54,000	54,000	54,000	54,000
577	27,000	27,000	27,000	27,000	27,000	27,000
578	50,000	50,000	50,000	50,000	50,000	50,000
591	17,000	17,000	17,000	17,000	17,000	17,000
592	16,000	16,000	16,000	16,000	16,000	16,000
593	17,000	17,000	17,000	17,000	17,000	17,000
594	23,000	23,000	23,000	23,000	23,000	23,000
595	20,000	20,000	20,000	20,000	20,000	20,000
596	54,000	57,000	57,000	57,000	57,000	57,000
597	121,000	120,000	119,000	119,000	118,000	118,000
Total	464,000	484,000	483,000	483,000	482,000	482,000

Source: TLMP 1990 Habitat Capability Model.

Numbers also include smolt production in lakes.

Table 4-16
Pink Salmon Habitat Capability (Smolt Production) from 1954 to 2145 by VCU

VCU	1954	1991	1995	2005	2115	2145
574	1,246,000	1,246,000	1,246,000	1,246,000	1,246,000	1,246,000
575	9,652,000	9,652,000	9,652,000	9,652,000	9,652,000	9,652,000
576 1/	2,353,000	4,656,000	4,656,000	4,656,000	4,656,000	4,656,000
577	624,000	624,000	624,000	624,000	624,000	624,000
578	5,525,000	5,525,000	5,525,000	5,525,000	5,525,000	5,525,000
591	4,995,000	4,995,000	4,995,000	4,995,000	4,995,000	4,995,000
592	2,302,000	2,302,000	2,302,000	2,302,000	2,302,000	2,302,000
593	5,619,000	5,619,000	5,619,000	5,619,000	5,619,000	5,619,000
594	3,242,000	3,242,000	3,242,000	3,242,000	3,242,000	3,242,000
595	4,046,000	4,046,000	4,046,000	4,046,000	4,046,000	4,046,000
596 1/	2,216,000	2,435,000	2,435,000	2,435,000	2,435,000	2,435,000
597	17,270,000	17,270,000	17,270,000	17,270,000	17,270,000	17,270,000
Total	59,091,000	61,613,000	61,613,000	61,613,000	61,613,000	61,613,000

Source: TLMP 1990 Habitat Capability Model

1/ Values include projections of additional productivity due to installation of a fish ladder in Rio Roberts Creek; however, no pink salmon have been observed above the fish ladder.

The alternatives were not modeled individually using the habitat capability models because of the small area of Class I and II riparian vegetation that would be affected in any alternative. With these small levels of affect for changes in LWD no significant differences would be predicted. LWD is a major component of stream habitat that can be affected by logging activity. Like sediment, LWD can have both positive and negative effects on streams, depending on the amount present. When trees are removed from riparian areas, particularly in Class I and II streams, it can have a direct adverse effect on fish habitat by reducing the input of LWD (see the *Water, Fish, and Fisheries* section in Chapter 3). For Class I and II streams it takes about 90 to 150 years after streamside tree removal before stream input of LWD from second-growth forests approaches that from the original old-growth forest (USDA Forest Service, 1991a). Basin areas that were harvested prior to TTRA regulations are still adjusting to the loss of sufficient size woody debris.

Most of the adverse effects of changes in LWD supply, such as reduction in supply to Class I and II streams, or increased debris flows causing stream bed scour, would be mitigated by the application of prescribed buffers and BMP's (see *Mitigation*, this section). Minimum 100-foot buffers for Class I and Class II streams would ensure gradual, long-term inputs of stable LWD, provided large areas of blowdown (windthrow) do not occur. Prevention and minimization of blowdown was developed using techniques described in the Southeast Alaska Guide for Reducing Wind Damage (Harris, 1989). The applied techniques use unit boundaries and harvest types, which incorporate partial retention around the unit perimeter, to reduce risk. The Ketchikan Area is currently monitoring stream buffer blowdown to determine the effectiveness of the buffers and other techniques (USDA Forest Service, 1992f). One function of no-harvest buffers is to maintain the supply of LWD to the stream. Windthrow is the most common source of natural LWD loading (Gregory and Ashkenas, undated). Consequently, the blowdown of portions of buffer strips merely changes the timing of debris inputs (Gregory and Ashkenas,

undated). Catastrophic blowdown of long lengths of buffer on Class I streams could reduce long-term input of LWD. If catastrophic blowdown creates a detrimental condition, e.g., barriers to anadromous fish, modification of the debris accumulation should be considered on a case-by-case basis.

Blowdown may result in a short-term pulse of LWD to streams. This LWD would then decay and eventually wash out. Thereafter, a shortage of LWD might occur, lasting until regrowth of new trees within the previously buffered area is complete (more than 100 years). A more even flow of LWD to streams is preferable to pulsed inputs followed by decline.

Road crossings of Class I and II streams remove trees for a maximum width of about 75 feet on both sides of the stream which directly affects the availability of LWD at these sites (see Table 4-11). However, the relatively small amount of Class I and II streamside vegetation removed (less than 1 percent of riparian management area in Class I and II streams) indicates that effects to fish habitat for any of the alternatives would be small.

Timber harvest along Class III streams will remove the long-term input of LWD to these streams. Data in Table 4-10 indicate that Alternative 12 has the most harvest of Class III stream length followed by Alternatives 11 and 10. This reduction in available LWD in Class III streams may result in reduced LWD delivery and increased sediment delivery to downstream Class II and I channels (USDA Forest Service, 1995a). That Class III streams are a significant source of LWD for streams lower in a drainage basin is not well documented. For example, Murphy and Koski (1989) indicate that LWD delivery to streams by landslides in Southeast Alaska averaged 4 percent (range 0 to 14 percent) depending on channel type. This value compares to 73 percent for bank erosion and windthrow and 23 percent for tree mortality directly along the Class I channels. Though major debris torrents in Class III channels can deliver all their contained LWD and sediment, the amount of LWD they contain may be low. For example, Nakamura and Swanson (1993) show that in steep Class III-type streams, LWD is often suspended above the channel, forming a bridge rather than forming an in-channel obstruction.

Removal of vegetation on the upper banks of many Class III stream channels, and along the lower banks of unbuffered Class III streams, might result in mobilization of bedload materials through eventual sloughing of banks, or the long-term decay of in-channel LWD which releases sediment from in-stream storage. For example, Smith et al. (1993) report increased coarse-sediment transport after experimental removal of all in-channel LWD on Chichagof Island. The LWD decay process and associated sediment 'delivery would be expected to occur over a period of many decades. For example, Murphy and Koski (1989) suggest that LWD would be decreased by 70 percent after a period of 90 years and would take 250 years to return to pre-harvest levels.

Additionally, the movement of these materials downstream, as well as possible increased streamflow in some heavily harvested drainages, might increase the probability of debris torrents. Current guidelines for harvest adjacent to Class III channels are designed to limit the quantity of logging slash and unstable debris that enters these channels, thereby reducing the potential for destructive debris torrents. Field reconnaissance of all harvest units has resulted in identification of stream channels and site-specific BMP prescriptions for buffers or split-yarding on Class III streams. Additionally, during final layout timber harvest units will be inspected again and final prescriptions detailed. Although some risk remains, the results of these mitigation actions will protect fish resources in Class I and II streams.

Temperature and Dissolved Oxygen

The application of appropriate stream and lake buffers and other BMP's would maintain sufficient stream and lake canopy closure and avoid any potential for significant temperature increases.

Marked increases in summer temperature (e.g., greater than 60.8°F) or reduction in winter temperatures that cause anchor ice to form, can have adverse effects to fish in streams and lakes (see *Water, Fish, and Fisheries* section in Chapter 3). Though fish kills in the Project Area have occurred, it is difficult to pinpoint the cause. Reports of fish kills have been linked to crowding of spawning fish in high escapement years and resulting deoxygenation of water from fish respiration. Such events are unpredictable and cannot be directly attributed to the effects of timber harvest.

The potential effects of timber harvest and road construction on stream temperature are discussed under *Water Quality* above, and are probably minimal. Slight increases in summer stream temperatures and reduction in winter water temperature are possible; the net biological effects of any such increases or decreases are difficult to assess, but are probably small. Thus, no net gain or loss of salmonid production because of changes in stream temperature is expected. Significant decreases in dissolved oxygen because of increased stream or lake temperatures are also not expected. Mitigation for site-specific possible temperature effects are discussed below in the *Mitigation* section under *Temperature Sensitivity.*

Miscellaneous Effects of Road Construction

Miscellaneous effects of road construction include potential effects on upstream fish passage and increased access to fisheries resources with a resulting increase in fishing pressure and exploitation rates.

Upstream fish passage, both for adult and juvenile salmon and trout, can be blocked when culverts are used to cross moderate- and high-gradient Class I or II streams. Proper implementation of BMP's for culvert installation will eliminate these potential impacts. Occasionally, culverts develop vertical drops at the downstream ends that fish cannot ascend. Water velocity within the culvert might be too fast for fish to swim against. To reduce these risks, culverts must be of the proper size and type for the particular stream, and must be correctly oriented and installed.

Even though culverts will be selected, installed, and monitored regularly to maintain fish passage, there is still the possibility that they will be undercut by the stream and might fail to allow passage of fish at lower flows, or that they will become blocked or fail entirely at some point in their service life. The risk of reduced fish passage is roughly proportional to the number of culverts used. This risk is somewhat greater in watersheds that have more Class I and II stream crossings (see Table 4-12). However, Forest Service BMP's for road construction require that culvert installation supply adequate fish passage to Class I and II streams. Implementation of BMP guidelines and proper monitoring (as described below) reduce risk so significant impacts to fish passage in the Project Area would not occur.

A potential indirect effect of new road construction on fish is to improve the roaded access to streams and lakes, resulting in the potential for increased subsistence harvest and recreational use of local fisheries resources. Road closures will reduce accessibility to some of the more important fisheries. The roaded access to some lakes would increase. For example, Angle Lake has a proposed roaded area and trail system planned which will increase access to the lake. The

harvest units near Angle Lake are contained in all alternatives. Both the creek and lake support coho, chum, pink and sockeye salmon, cutthroat, rainbow and steelhead trout and Dolly Varden char, all of which may be vulnerable to increased fishing pressure.

Increased lake and stream access might also increase fisheries harvest rates in the Shinaku watershed. Species of concern again include pink, chum and coho salmon as well as Dolly Varden, cutthroat, rainbow and steelhead trout. Shinaku Lake supports Dolly Varden char, cutthroat and rainbow trout as well as grayling. Fishing and boating access to Shinaku Lake and watershed would be encouraged by new road access where it previously did not exist. Currently, the only access to Shinaku Lake is from float planes. The roaded access to the lake will create a higher risk of increased harvest of local fisheries resources. The harvest units around Shinaku Lake are contained in all alternatives.

Risk

Buffering of streams based on TTRA, the TLMP Revision (1997), and applying BMP's (see *Mitigation* section for details) will greatly reduce impacts to fisheries resources for all alternatives. However, because of the difficulty of predicting the exact mitigation effectiveness and implementation of these actions, some risk to fisheries resources remains after these actions are taken. Increased risk does not indicate impacts to the resource, as none of the alternatives are predicted to have significant adverse affects to fisheries resources because of the implementation of stream buffers, other TLMP guidelines, and Forest Service BMP's.

One way to evaluate and compare the potential risk of impacts among the alternatives is to examine the buffers applied under these guidelines. Tables 4-9 and 4-10 show the total length of buffers by stream class applied to the alternatives.

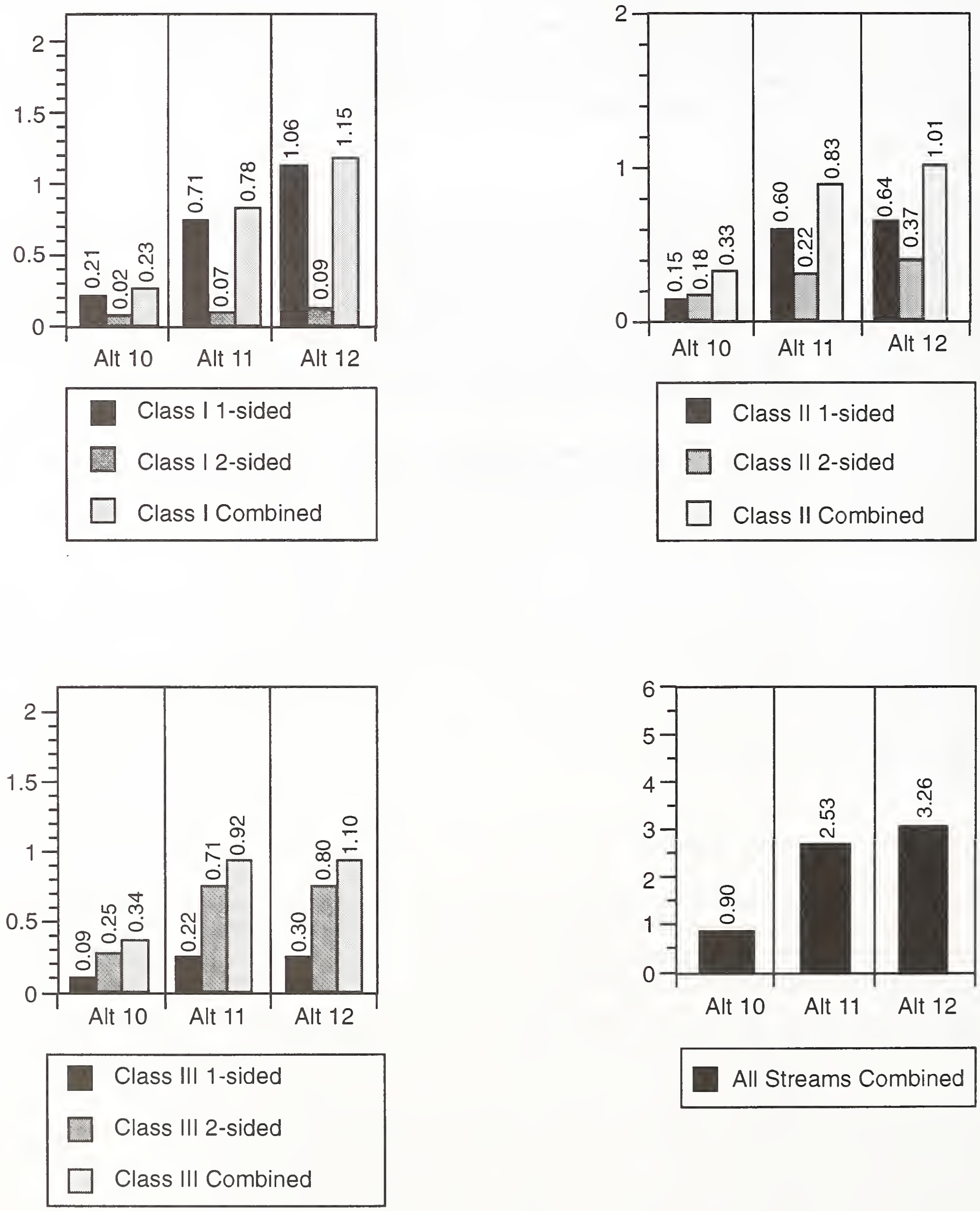
In Figure 4-1, the lengths in miles, of buffer and BMP treatments have been normalized (divided by the average value within each stream class for all action alternatives) and weighted based upon the level of risk. Dividing by the average value for all alternatives (normalizing) makes the numbers more directly comparable despite the difference in overall stream lengths affected in the various alternatives. The following weighting procedures were used:

- The normalized lengths of one-sided buffers and one sided BMP treatment were weighted with a factor of 1.

- The normalized lengths of two-sided buffers and one sided BMP treatment were weighted with a factor of 2.

Normalizing and weighting the values within each stream class allows each of the alternative buffer strip and BMP-treatment categories to be combined. This combination facilitates comparison of the alternatives in terms of their overall risk of effects to anadromous fish, resident fish, and downstream water quality. When comparing the alternatives, it is important to remember the alternative with the greatest length of buffered Class I and II streams also has the greatest potential risk of impacts to fish habitats. A reduced length of buffer means less logging will approach Class I or II streams, thus reducing the risk of channel and sediment effects. In general, potential blowdown is proportional to the length of stream buffer; if more buffers are applied, the risk of buffers blowing down is increased. The same general rule applies to BMP's; the greater the length of stream treated with BMP's, such as split yarding of streams or full suspension of logs over channels, the greater the risk. Normalized values in Figure 4-1 retain this basic relationship: the higher the number the greater the risk. Generally, Alternative 12 has the highest risk individually for Class I, II, and III streams, while Alterna-

Figure 4-1
Relative (Dimensionless) Risk of Potential Effects to Class I, Class II, Class III, and All Streams Combined Based on Quantity, Type, and Location of Stream Buffering



tives 11 and 10 have progressively less risk for each stream class (Figure 4-1). A combined ranking of alternatives, including risk of effects to anadromous fish streams, resident fish streams, and water quality shows that Alternative 12 has a higher risk than the other three alternatives, followed by Alternative 11 and then 10.

Cumulative Effects

Cumulative Watershed Effects Analysis

Cumulative watershed effects (CWE) can be evaluated by examining harvest thresholds within specified time periods to address the effects of timber harvest on stream flow increases and sediment inputs. Two CWE thresholds are defined that apply to third order and larger watersheds. These harvest thresholds represent two ways to measure cumulative effects. For the first CWE threshold, cumulative ground-disturbing activities are limited to 35 percent of the total watershed acreage over a 15-year period unless analysis indicates otherwise (USDA Forest Service, 1991a). Watershed groupings were based on Forest Service watershed designations. However, large watersheds (Thorne River, Steelhead Creek, etc.) were subdivided to provide a more consistent size of watersheds for analysis. Third order and larger watersheds containing Class I and II streams were subdivided within the larger watersheds. This provided the ability to isolate the effects on small watersheds that might otherwise be obscured within the larger watersheds. The Control Lake Fisheries and Watershed Report (Rogers and Ablow, 1995) contain the results of this analysis for subwatersheds.

Table 4-17 shows the cumulative acreage harvested on federal lands in the last 15 (1983-1997) years by third order and larger watershed for the Control Lake Project alternatives. This analysis includes all federal, state, and private lands in the Project Area. None of the watersheds exceed the 35 percent limit, although several watersheds exceed 20 percent. No additional harvest is planned in these watersheds for this entry. At the maximum level of harvest in this entry (Alternative 12) none of the watersheds would exceed 30 percent harvest during the past 15 years.

For the second CWE analysis, the percentage of Riparian Management Area (RMA) acreage harvested along high-gradient contained channel types in third order and larger watersheds is limited to 25 percent of the total RMA associated with these channel types over a 20-year period. Table 4-18 displays the results of this analysis and shows one watershed (D04A) that currently surpasses the 25 percent level. However, no Control Lake harvest units are located within this watershed. The Control Lake Project would result in only two watersheds, Goose Creek (C49B.1) and Election Creek (C96A), reaching the 15 percent level, but none would exceed 15 percent after project implementation. As in the first CWE analysis, this analysis was extended to subwatersheds (Rogers and Ablow, 1995).

This analysis is sensitive to the resolution of the stream data for a watershed and to the overall relief of a watershed. High gradient streams were found to be under-represented in the GIS database when compared to field verified areas. Consequently, the analysis tends to underestimate the percentage of high gradient streams within a watershed and overestimates the percentage of harvest along high gradient streams within harvest units.

The following silvicultural practices have also been implemented to mitigate the effects of timber harvest. Partial cutting, in the form of Seed Tree; Shelterwood; and group selection harvest, are used to enhance stocking, relative vigor, and species composition where it is appropriate In some units, the silvicultural prescriptions require that cedar be retained within the unit or along unit boundaries. This is expected to improve the potential for increasing the cedar regeneration within the units where it may be out competed by other species. In order to maintain the high abundance of Alaska yellowcedar, reserve trees are often prescribed to provide seed and shelter for yellowcedar regeneration. Harvest units where this measure would apply currently sustain moderate to high levels of Alaska yellowcedar and have plant associations that favor Alaska yellowcedar growth. Units that incorporate specific mitigation measures are identified on the unit cards and in the silvicultural prescriptions.

Monitoring

Project-specific monitoring is recommended as an ecosystem management measure to monitor the implementation and effectiveness of different types of clearcutting with reserve trees, and various types of partial cutting and uneven-aged management techniques prescribed for the Control Lake Project Area units. Monitoring should determine the degree that reserve tree blowdown occurs and how this blowdown is affected by site factors. Monitoring should also examine regeneration and stand development following each harvest type. Implementation and effectiveness of timber standards and guidelines will be monitored as part of the Forest Plan monitoring report.

Wildlife

Key Terms

Habitat—the sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat capability—an estimated number of animals that a habitat can sustain.

Management Indicator Species (MIS)—species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management activities.

Viable population—the number of individuals of a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations, well distributed throughout their range in the national forest.

Wildlife Analysis Area (WAA)—division of land identified by the Alaska Department of Fish and Game (ADF&G) and used by the Forest Service for wildlife analysis.

This analysis considers the direct, indirect, and cumulative effects of the alternatives proposed for the Control Lake Project. Effects are projected to 2007, the anticipated end of the proposed action and to 2095 to show the cumulative effects of ongoing Forest Plan implementation.

Wildlife Habitats

Wildlife species are individually adapted to combinations of plant community types and successional stages. Changes in plant communities or successional stages may result in changes in animal communities. Generally, the more diverse the vegetation, the greater the abundance and variety of wildlife species in an area. The probability of maintaining viable populations increases if suitable habitat is present in sufficient types, amounts, and spatial arrangements on a landscape level. Changes in forest cover types or successional stages occur as a result of natural and human caused disturbance. Timber harvest may add to, or detract from, the diversity of an area depending on existing conditions and the type and amount of harvest planned.

The effects of the proposed alternatives differ for various groups of wildlife in relation to their habitat requirements, feeding habits, and interaction with humans. Wildlife species used to gauge the impact of proposed alternatives include MIS and Threatened, Endangered, and Sensitive species that are potential inhabitants of the area.

Timber harvest and road construction are the principal activities likely to generate direct, indirect, and cumulative effects on wildlife in the Control Lake Project Area. Effects on wildlife from trapping, hunting, and recreational activities are indirectly tied to the type and magnitude of timber harvest. Timber harvest and road construction have the potential to affect wildlife resources through (1) habitat alteration, (2) disturbance from project activities, and (3) increased post-harvest human access. Greater public access in turn increases the vulnerability of game animals to hunting and of furbearers to trapping, and may cause shifts in species traditional use patterns.

Proposed harvest acreage by volume stratum is presented for each alternative in Table 4-9. The alternatives propose to harvest from 964 acres under Alternative 10 to 3,769 acres under Alternative 12. These acres are mostly made up of mapped productive old growth, which ranges from 834 acres under Alternative 10 to 3,328 acres under Alternative 12. This represents a harvest of 1.1 to 4.4 percent of the existing productive old growth in the Project Area. Alternatives 11 and 13 would harvest 3.4 percent and 3.0 percent of the existing productive old growth in the Project Area, respectively.

Fish Resources

Cumulative effects on fish resources were evaluated by examining the results of long-term predications of fish habitat capability models and other nonmodeled factors. Predictions of changes in fish habitat potential are presented for the MIS (Tables 4-14, 4-15, and 4-16). Coho and pink salmon over the long-term show overall increase in potential from 1954 to 2145, averaging increases of 4 and 4.3 percent, respectively. The increase is a result of installation of fish passage facilities on several streams (see Chapter 3). Pink salmon habitat capability predictions remain unchanged after 1995, but the pink salmon habitat capability model assumes no effects from any harvest activities. However, coho habitat capability in some VCU's continues to decrease beyond 1995. Long range predictions indicate that coho potential in several of the watersheds in VCU's 574, 577, 578, 595, 597 continue to decrease in potential, resulting from logging activity that occurred prior to 1979, which includes the continual breakdown of existing LWD where no recruitment potential exists. The continued reduction in potential is the result of loss of LWD in the streams because of substantial streamside harvest (see Chapter 3) of Class I streams in these watersheds between 1954 and 1979. The habitat potential begins to increase in these streams prior to 2145 (approximately 90 to 150 years after harvest) because of input of LWD to these streams from the development of riparian second-growth forests. Proposed actions taken under the Control Lake Project would not contribute to this predicted decline in projected habitat capability for coho salmon. Dolly Varden habitat capability decreases over time from 1954 to 2115, averaging a 0.36 percent decrease in the Project Area. The largest decrease occurs in VCU 597, which is part of the Lower Thorne River, Rio Beaver and Goose Creek Watersheds. Again this is from older harvest, not from results of any of the considered alternatives. Based on these models, none of the alternatives will have cumulative adverse effects on fish resources.

Consideration of factors that cannot be included in the models suggests minor cumulative effects could occur to fisheries resources from the considered alternatives. In spite of TTRA buffers, extended width buffers, and implementation of BMP's, some increased risk of loss of stream habitat could occur. Factors such as unexpected logging-induced landslides, logging-enhanced blowdown, and impassible culvert installation could contribute to some minor adverse cumulative effects to the Project Area's fisheries resources. Because of the many mitigation measures (see *Mitigation* in this section) that will be implemented during harvest activity, these effects will be minor and not of significance. Also, the use of Knutson-Vandenburg (KV) funds, generated from logging sales receipts, to improve habitat and to open new areas for anadromous stocks by installation of fish passage may result in benefits above those predicted in the models.

Mitigation

Mitigation measures to reduce the magnitude of potential effects on water quality, streams, fish, and fisheries resources include planning, application of BMP's, application of appropriate stream buffer prescriptions, and road-access management prescriptions. These topics are discussed below. Appendix C and the unit and road cards (Appendices F and G) identify which mitigation measures apply to each harvest unit and road segment.

Water Quality

Mitigation for protecting water quality occurs through both planning and the implementation of BMP's. These mitigation measures are documented in Chapter 10 of the Forest Service Soil and Water Conservation Handbook (FSH 2509.22) and are discussed in the Alaska Nonpoint Source Pollution Control Strategy. Mitigation of sediment inputs by roads to streams is accomplished through transportation planning, route location, contract preparation, and contract administration (Mitigation Measures F1 and F2). These procedures allow avoidance of

hazardous areas during planning, the field documentation and avoidance of additional hazardous sites, the incorporation into the contract of site-specific recommendations, and contract administration to ensure compliance.

Other mitigation measures discussed in the FSH 2509.22 include those in the following discussion. Where surface-disturbed areas on roads are subject to erosion, they will be stabilized using techniques such as water barring, cross draining, outsloping, or other suitable means. To prevent water from flowing long distances over exposed ground, measures such as ditches, cross-drain spacing, and culverts will minimize soil erosion and sedimentation. The seeding and fertilizing of cut slopes, fill slopes, and other disturbed areas will prevent soil erosion and sedimentation. Landings will be located and designed for erosion control; they will have proper drainage during use and shall be ditched or sloped to permit drainage and dispersion of water when abandoned. These procedures are broadly grouped as Mitigation Measure F8.

The above procedures have been found to be generally effective in mitigating sediment inputs to streams (MacDonald, 1991; EPA, 1993). Stream buffer prescriptions and other BMP's related to streams are also applied and discussed below. Because these practices are relatively new, both implementation and effectiveness monitoring is being conducted and should be continued. Implementation and effectiveness monitoring procedures are discussed in Monitoring under this section.

In addition, several subwatersheds have been identified as being at higher risk of road sediment input. These watersheds are: C49B.2100 (part of the Rio Beaver drainage); D12A.0100 (part of the Nossuk River drainage); C21C.0405 (Logjam Creek watershed); C49B, C49B.0001, and C49B.2100 (within the Rio Beaver watershed); C49B.2403 (Control Creek watershed); C49B.2701 (North Thorne River watershed); and D12A.0100 (see *Appendix D* of the Draft EIS). In these watersheds it is imperative that BMP's (including ongoing road and culvert maintenance) be fully implemented to protect water quality and fish habitat.

Stream Buffer Prescriptions and BMP's

Buffers zones and BMP's along streams (Mitigation Measures F5, F6, and F7) are techniques implemented to reduce physical impacts to stream water quality and habitat. The extent of their application across the Project Area provides a general indication of mitigation of potential effects on streams.

Implementation of buffer prescriptions will largely mitigate potential impacts to streams. Buffers applied at the planning stage are variable-width buffers (buffers greater or less than 100 feet wide). They are designed to be flexible and to provide the best level of protection to streams based on differences in channel type and stream class. Site-specific resource conditions, such as concern for windfirmness or adjacent hazard soils, resulted in some additional widening of buffers beyond planned buffer widths. Stream segments with extended-width buffers benefit from a higher level of protection than the TTRA requires. Directional felling and split yarding along Class III streams (Mitigation Measure F6) and buffers in steep V-notch streams with high erosion potential (Mitigation Measure F7) provide additional protection. Tables 4-9 and 4-10 show the actual extent of stream buffer and BMP application for the alternatives.

Stream buffers and BMP's have been found to be effective in mitigating stream temperature effects, sediment inputs, and loss of fish habitat (MacDonald, 1991; EPA, 1993; Binkley and Brown, 1993). In addition, long-term effectiveness monitoring is required by the Memorandum of Agreement (MOA) between the ADEC and the Forest Service (USDA Forest Service, 1992d).

Temperature Sensitivity

Canopy cover is an important factor governing stream heating and cooling. Lower elevation streams with a southerly aspect would experience greater temperature changes than higher elevation streams with a northerly exposure. Some streams because of their topography, watershed features, and orientation, could have temperatures over optimum during hot, dry summers. These same streams may be particularly susceptible to increased temperature if adjacent tree canopies are removed during timber harvest. The application of appropriate stream buffers and other BMP's would maintain sufficient stream and lake canopy closure and mitigate any potential for significant temperature increases for most streams.

Historical land management practices that occurred on both private and federal land in certain watersheds may also contribute to a stream's unmanaged temperature sensitivity. A group of mainstem streams were highlighted primarily because of their southern exposure and low elevation. These streams are: Goodrow Creek, Elevenmile Creek, Shinaku Creek, Election Creek, Steelhead Creek, the North Thorne River, part of the upper Cutthroat Creek, Snakey Lakes, Stream 103-60-11, Stream 103-60-25, Stream 103-60-07, Stream 103-60-05, Stream 103-60-03, and James Creek. Though these mainstem streams may be susceptible to temperature change, they are currently protected by TTRA buffer requirements and will not be affected by timber practices.

An additional screening was conducted of potentially temperature sensitive Class III streams within harvest units in these watersheds. The following characteristics were evaluated: south-facing slopes, lack of immediate downstream forested stream buffers, historical and continued harvest activities, adjacency to other units not yet providing enough shade, and adjacency to ponds and muskegs (FSH 2609.24, Appendix 4). Assessment of potential temperature sensitivity included evaluation of unit cards, GIS mapping, orthophotos, and topographic maps. The units which contain these Class III streams are: 574-434, 547-435, 574-436, 578-402, 592-413, 594-416, 594-420,595-406, 595-411, 595-414, 595-434. Mitigation measures prescribed for these units include selective harvest buffers, moving unit boundaries away from the stream, or a Type A clearcut border which leaves unmerchantable timber and deciduous trees to assure adequate shading.

Nossuk Creek has been considered a temperature sensitive stream (USDA Forest Service, 1993). This potential temperature sensitivity was identified because it is a wide stream with low flow velocities and little natural overhead shading of riparian vegetation. There are no Control Lake harvest units adjacent to Nossuk Creek. The road accessing unit 591-405 does cross one of the upper tributaries of Nossuk Creek. The amount of right-of-way clearing for the road will not have a significant influence on the riparian shading of this tributary.

Road Construction Timing, Culverts, and Road Access Management

Road construction would adhere to the standard "timing windows" to avoid potential adverse effects of increased sediment inputs to streams during periods of salmonid egg/alevin incubation (Mitigation Measure F10). The timing of construction for the Ketchikan Administrative Area are conservatively established to be June 1 to August 7 for pink and chum salmon, June 15 to September 1 for coho salmon, June 15 to August 15 for sockeye salmon, and July 18 through August 15 for steelhead trout. However, because of the variability of fish presence, abundance, and timing by system, the exact dates of allowable construction may vary from those presented. Additionally, site-specific techniques during low flow periods can extend the timing window. These construction restrictions are designed to protect coho, pink, and chum salmon and steelhead trout spawning by reducing in-stream bridge and culvert activity at times when eggs

may be in the gravel and during smolt migration. Proper culvert selection and installation would minimize the risk of blocking fish passage; culverts would be monitored and maintained on a regular basis. Culvert installation and design should follow standard Forest Service BMP's for culverts (USDA Forest Service, 1979b). For larger streams, bridges may be more suitable to insure fish passage. Installation of project structural plate arch culverts are recognized as the most effective culvert design of fish passage (Furniss et al., 1991).

Logging Debris Management

Logging debris generally is removed from streams. Split yarding and controlled felling practices would prevent large amounts of logging debris from entering streams during logging and road-building operations. Existing LWD in stream channels would be left in place. Opportunities for fish passage barrier removal identified during routine monitoring would be evaluated (Mitigation Measure F11).

Monitoring

The April 1992 MOA between the ADEC and the Forest Service Alaska Region (USDA Forest Service, 1992e) is the basis for the maintenance of water quality and beneficial uses on the Project Area. BMP's are the primary means to mitigate sediment and other water quality effects to the water resource. BMP's are evaluated by implementation monitoring and effectiveness monitoring. BMP's are recognized as effective in maintaining water quality (ADEC, 1990; EPA, 1993). The forest-wide monitoring plan described in the TLMP Draft Revision (USDA Forest Service, 1991a) lists two monitoring activities specifically aimed at BMP's. One is directed at BMP implementation (Watershed Monitoring Item 1) and the other is directed at BMP effectiveness (Watershed Monitoring Item 2). Additional monitoring of BMP's is included under fish and watershed monitoring activities. The Ketchikan Area Office and ADEC are currently coordinating to identify the specific procedures and protocols for documenting implementation monitoring on the Ketchikan Area. Additional monitoring is discussed in the Ketchikan Area Monitoring Strategy (USDA Forest Service, 1994).

Since BMP's have been designed and are presumed to meet State Water Quality Standards, they must be implemented as required and as instructed in the Alaska Nonpoint Source Pollution Control Strategy (ADEC, 1990) and Chapter 10 of the Forest Service Soil and Water Conservation Handbook. The timber sale contract administrator, as the person with day-to-day project contact, will be primarily responsible for ensuring the implementation of BMP's.

Monitoring includes both routine field observations and comprehensive monitoring projects. Routine monitoring includes visual observations and documentation. Again, the timber sale contract administrator, as the person with day-to-day project contact, is primarily responsible for routine monitoring. The visual observations include road runoff, proper culvert and bridge placement procedures, water turbidity at culverts and bridges, and revegetation.

Comprehensive monitoring includes, but is not limited to, evaluations that provide quantitative documentation. Comprehensive monitoring plans are currently being developed and discussed with ADEC. These comprehensive monitoring activities will follow procedures in the Alaska Nonpoint Source Pollution Control Strategy (ADEC, 1990) and the Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska (MacDonald, 1991).

Baseline monitoring, which describes the range and trends in temporal and spatial water quality variations, is a type of monitoring activity that is considered optional under the MOA (USDA Forest Service, 1992e). Baseline data does not exist for the Control Lake Project Area.

Analysis of water resource data at the watershed and subwatershed scale provides a geographic assessment of localities that may be targeted for monitoring. The Control Lake Fisheries and Watershed Resource Report (Rogers and Ablow, 1995) displays conditions and potential impacts by subwatershed in the Project Area. The subwatersheds displaying high proportions of the acres to be harvested containing wetlands, RMA's, high road concentrations, or cumulative harvest acres are good targets for monitoring efforts. They could contribute to determining the adequacy of Forest Service Standards and Guidelines and BMP's.

Silviculture, Timber, and Vegetation

Key Terms

Advanced Regeneration—Natural conifer reproduction established beneath an existing forest canopy; comprised of trees ranging from 5 to 20 feet in height.
Allowable Sale Quantity—The maximum quantity of timber that may be sold in each decade from suitable scheduled lands covered by the Forest Plan.
Basal Area (BA)—The area of the cross section of a tree stem, or group of trees, measured at 4.5 feet above ground; usually presented as total square feet per acre.
Blind Lead—An area within a harvest unit that is difficult to yard (remove felled timber) with conventional cable logging systems on convex slopes.
Board Foot (BF)—Lumber or timber measurement term. The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.
Climax Plant Community—The final or stable biotic community in a successional series which is self-perpetuating and in dynamic equilibrium with the physical habitat; the assumed end point in succession.
Commercial Forest Land (CFL)—Land that is capable of producing continuous crops of timber (20 cubic feet per acre of tree growth annually, or at least 8 MBF/acre).
Ecosystem—all of the organisms in a given area interacting with the physical environment so that the flow of energy leads to an exchange of materials between living and nonliving parts within the system.
Even-Aged Management—The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The age difference between trees in the canopy level usually does not exceed 20 percent. Clearcut, Shelterwood, or Seed Tree cutting methods produce even-aged stands.
Falldown—The difference between planned or scheduled harvest and that which is attained after implementation.
Forest Land—Land at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.
MBF—Thousand board feet.
MMBF—Million board feet.
Partial Cutting—Removal of selected trees within a forest stand in any variety of spatial patterns. This may include thinning, selective cutting, Shelterwood or an overstory removal.
Plant Association—A basic unit of vegetation classification based on land management potential, species composition, successional patterns, and the climax plant community.
Precommercial Thinning—The practice of removing some of the trees less than merchantable size from a stand to improve tree growing space and promote rapid growth. Trees will grow faster due to reduced competition for nutrients, water, and sunlight.
Reserve Trees—Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.
Shade Tolerance—Tree species that have physiological growth processes adapted to shaded environments Western hemlock is a shade tolerant species. Other tree species tolerance to shade may range from tolerant to intolerant.
Silvical Characteristics—Physiological and genetic characteristics of individual tree species and the ecological characteristics (biological and environmental factors) of the site which enable a specific species to be adapted to a particular and unique site.
Silvicultural Practices—Management techniques used to modify, manage and replace a forest over time. Silvicultural practices are classified according to the method of carrying out the process (Shelterwood, Seed Tree, clearcut, commercial thinning, etc.).

Silviculture—The art, science and practice of controlling the establishment, composition, structure and growth of trees and other vegetation in forest stands.
Site Index—A measure of a forest areas relative productive capacity for tree growth. Measurement of site index is based on height of dominant trees in a stand at a given age.
Succession—A series of dynamic changes by which one group of organisms succeeds another through stages leading to a potential natural community or climax. The process of plant community development after disturbance involves changes in species composition over time.
Suitable Forest Land—Commercial forest land identified as having the biological capability to sustain long-term timber production (that has not been withdrawn from timber production).
Uneven-Aged Management—The application of management techniques which will maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.
Volume Class—Classification system used to differentiate timber stands into similar average volume per acre categories or strata.

Environmental Consequences

This section describes the potential direct and indirect effects of timber harvest to the timber and vegetation resources from implementation of an action alternative. Timber harvest activities on the Tongass National Forest are strictly governed by Federal and state law, and Forest Plan standards and guidelines designed to minimize detrimental effects to other resources.

Direct Effects

Direct environmental effects are those occurring at the same time and place as the result of the implementation of one of the timber harvest action alternatives.

Forest Plant Communities

Timber harvest activities will influence forested plant communities, but will have little affect on non-forested plant communities. The only exception would be road segments that cross non-forested cover types. Timber harvest activities will convert the plant community seral stage of forest stands into earlier successional stages. Although timber harvest will change the current seral stage, harvesting does not change the potential climax community that can be achieved on a particular site. Because climax communities are based on climate, geology, and soils of the area, the effect of unit harvest upon the existing plant association series will be negligible (Table 4-19). The exception to this is the removal of land area from timber productivity for the reasonably foreseeable future due to road construction activities (Table 4-20).

Table 4-19
Acres of Proposed Harvest by Plant Series and Alternative

Plant Series	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Western Hemlock	0	387	1,380	1,721
Sitka Spruce	0	0	3	8
Mixed Conifer	0	6	260	401
Mountain Hemlock	0	13	16	16
W. Hemlock/W. Red Cedar	1,781	725	1,5	1,759
Muskeg	0	150	395	547
Total	0	1,281	3,612	4,452

Source: GIS query, USDA Forest Service, TNF

Table 4-20
Miles of Proposed Road Across Forested Plant Communities

Plant Series	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Western Hemlock	0	7.7	25.3	29.5
Sitka Spruce	0	0.1	0.1	0.1
Mixed Conifer	0	1.6	5.5	10.3
Mountain Hemlock	0	0.8	1.8	1.4
W. Hemlock/W. Red Cedar	0	9.0	20.2	22.3
Total	0	19.3	52.9	63.6

Source: GIS query, USDA Forest Service, TNF

Non-forested Cover Types

Timber harvest may affect the non-forested vegetation communities because of road building activities that cross these communities. GIS mapping also identified some non-forested cover types within some units, although field verification activities identified the areas as at least partially forested. Alder shrublands, alpine vegetation, and rock, located at upper elevations and/or the edge of the merchantable timberline, should not be significantly affected. The shrubland community type occurs across several slopes where road building will take place. The muskeg community type borders many of the units in the Project Area and also exists in large areas between units (Table 4-21).

Table 4-21
Miles of Proposed Road Across Non-forested Vegetation Communities

Vegetation Series	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Muskeg vegetation	0	6.8	19.5	25.8
Alpine vegetation	0	0.0	0.0	0
Shrubland	0	0.3	0.3	0.3
Estuary vegetation	0	0.0	0.0	0
Major river systems	0	0.0	0.0	0
Total	0	6.8	19.8	26.1

Source: GIS query, USDA Forest Service, TNF

Threatened and Endangered Plant Species

Effects on threatened, endangered, and sensitive plant species are discussed in the *Threatened, Endangered, and Sensitive Species* section of Chapter 4.

Volume Class

The number of acres proposed for harvest within each VCU and volume class; and the percentage of the existing Project Area volume class acreage that would be removed is shown in Tables 4-22 through 4-24 for Alternatives 10, 11, and 12. No harvest is proposed within the Project

Table 4-22
Proposed Harvest of Volume Class Acreage by VCU for Alternative 10

	Volume Class 4		Volume Class 5		Volume Class 6	
VCU	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0.0	0	0.0	0	0.0
575	0	0.0	0	0.0	0	0.0
576	6	0.3	0	0.0	0	0.0
577	0	0.0	0	0.0	0	0.0
578	0	0.0	0	0.0	0	0.0
591	0	0.0	0	0.0	0	0.0
592	0	0.0	0	0.0	0	0.0
593	0	0.0	0	0.0	0	0.0
594	84	3.0	68	3.5	0	0.0
595	173	6.2	142	5.9	12	0.6
596	0	0.0	25	1.4	0	0.0
597.1	35	11.9	0	0.0	5	1.1
597.2	203	6.0	312	7.9	30	3.1
Total	501	1.7	547	1.8	48	0.4

	Volume Class 7		Undesignated1/		Total	
VCU	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0.0	0	0.0	0	0.0
575	0	0.0	0	0.0	0	0.0
576	0	0.0	8	0.1	14	0.1
577	0	0.0	0	0.0	0	0.0
578	0	0.0	0	0.0	0	0.0
591	0	0.0	0	0.0	0	0.0
592	0	0.0	0	0.0	0	0.0
593	0	0.0	0	0.0	0	0.0
594	0	0.0	7	0.1	159	1.4
595	25	2.6	41	0.4	389	2.0
596	0	0.0	1	0.0	26	0.2
597.1	0	0.0	17	1.2	57	1.8
597.2	7	2.8	84	1.0	636	3.0
Total	28	0.8	157	0.2	1,281	0.8

Source: GIS query, USDA Forest Service, TNF

% of existing = % to be harvested from the existing volume class acreage in each VCU.

1/ Includes areas which are not currently mapped with a volume class designation. These areas represent inclusions within or along the edges of harvest units that should be upgraded to Volume Class 4 or higher based on ground verification.

Table 4-23
Proposed Harvest of Volume Class Acreage by VCU for Alternative 11

	Volume Class 4		Volume Class 5		Volume Class 6	
VCU	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0.0	0	0	0	0.0
575	39	1.0	126	2.6	50	2.6
576	0	0.0	0	0.0	0	0.0
577	69	2.5	58	2.2	13	1.6
578	59	5.6	10	1.0	29	2.9
591	21	2.1	19	1.4	0	0.0
592	0	0.0	0	0.0	0	0.0
593	79	4.3	123	6.8	0	0.0
594	368	13.1	271	14.0	0	0.0
595	272	9.7	247	10.3	115	5.6
596	67	3.7	101	5.5	164	12.6
597.1	3	1.0	13	2.4	12	2.8
597.2	295	8.0	490	12.5	49	4.9
Total	1,274	4.3	1,458	4.8	431	3.4

	Volume Class 7		Undesignated[1/]		Total	
VCU	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0.0	0	0.0	0	0.0
575	0	0.0	22	0.4	237	1.3
576	0	0.0	0	0.0	0	0.0
577	0	0.0	15	0.2	156	1.0
578	9	1.0	28	2.1	134	2.1
591	0	0.0	21	0.5	61	0.7
592	0	0.0	0	0.0	0	0.0
593	0	0.0	26	0.3	229	1.7
594	0	0	78	1.4	716	6.3
595	22	2.8	64	0.7	719	3.7
596	1	0.6	19	0.3	353	2.9
597.1	0	0.0	1	0.1	29	0.9
597.2	5	1.8	138	1.7	978	4.7
Total	36	1.0	413	0.5	3,612	2.1

Source: GIS query, USDA Forest Service, TNF

% of existing = % to be harvested from the existing volume class acreage in each VCU.

1/ Includes areas which are not currently mapped with a volume class designation. These areas represent inclusions within or along the edges of harvest units that should be upgraded to Volume Class 4 or higher based on ground verification.

Table 4-24
Proposed Harvest of Volume Class Acreage by VCU for Alternative 12

VCU	Volume Class 4		Volume Class 5		Volume Class 6	
	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0	15	0.5	0	0
575	194	4.9	231	4.7	76	4.0
576	0	0	0	0	0	0
577	85	3.1	77	2.9	13	1.6
578	61	5.6	10	1.0	29	2.9
591	21	2.1	19	1.4	0	0
592	0	0	0	0	0	0
593	158	8.5	308	17.0	0	0
594	374	13.4	292	15.1	0	0
595	324	11.6	226	9.4	115	5.6
596	75	4.1	101	5.5	164	12.6
597.1	15	5.1	53	11.8	17	3.8
597.2	303	9.0	508	12.9	49	4.9
Total	1,610	5.4	1,839		463	3.7

VCU	Volume Class 7		Undesignated[1/]		Total	
	Harvest	% of Existing	Harvest	% of Existing	Harvest	% of Existing
574	0	0	0	0	16	.01
575	0	0	38	0.3	539	3.0
576	0	0	0	0	0	0
577	0	0	18	0.2	194	1.3
578	9	1.1	28	2.1	136	2.1
591	0	0	21	0.5	61	0.7
592	0	0	0	0	0	0
593	0	0	50	0.5	517	3.9
594	0	0	81	1.5	748	6.6
595	22	2.8	78	0.8	764	4.0
596	1	0.6	20	0.3	362	3.0
597.1	7	2.6	21	1.5	112	3.8
597.2	5	1.8	141	1.7	1,006	4.8
Total	44	1.2	496	0.6	4,452	2.6

Source: GIS query, USDA Forest Service, TNF

% of existing = % to be harvested from the existing volume class acreage in each VCU.
1/ Includes areas which are not currently mapped with a volume class designation. These areas represent inclusions within or along the edges of harvest units that should be upgraded to Volume Class 4 or higher based on ground verification.

Area for Alternative 1. These tables provide an overview of the distribution of harvest across the Project Area for each volume class and alternative. The existing volume class acreage, used to calculate the percentage of volume class to be harvested, is based upon what is left on National Forest Land within the Project Area (including unsuitable and unavailable land) after full implementation of the 1989-1994 EIS. Additional information on volume class harvest is provided in Boyce and Goering (1994 and 1995).

Site Class

In general, low site class lands produce lower volumes per acre over a given time period than high site class lands. It is generally more economically feasible to harvest the sites with the higher productivity rating. However, other factors are considered when establishing harvesting priorities, so harvest units are generally distributed across a range of productivity classes.

Estimates of site productivity (site index) in southeast Alaska old growth stands can be best obtained from examination of the soil. Soil-site relationships have been developed, as a measure of site class, based primarily upon depth and drainage of soil and parent material (Ruth and Harris, 1979). Site classes are assigned to each of the soil type mapping units and have not been mapped on a site specific basis. Table 4-25 shows the level of harvest that would occur within each site class category for Alternatives 10, 11, and 12.

Forest floor vegetation

Table 4-25
Proposed Harvest Acreage in each Site Class by Alternative

	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Very Low (0-40 Site Index)	0	105	376	522
Low (41-60 Site Index)	0	143	372	462
Medium (61-80 Site Index)	0	490	1,091	1,356
High (> 80 Site Index)	0	542	1,774	2,113
Total	0	1,281	3,612	4,452

Source: GIS query, USDA Forest Service, TNF.

Site index is based on a 50-year baseline.

Note: Most very low site class acres have been field-verified as productive timberland. However, some are inclusions of very low site lands within productive harvest units.

In all action alternatives, the majority of the harvest (78 to 81 percent) is proposed to come from the sites of medium and high productivity. The area within low productivity site classes currently makes up 19 to 22 percent of the proposed harvest. Most of the areas mapped as a very low site index within the units have been field verified as productive timberland, containing greater than 8,000 board feet per acre. However, there are some inclusions of unproductive land within the harvest units that would be classified as very low site class.

Proposed Harvest Volume

Table 4-26 provides an estimate of the total volume expected to be harvested for Alternatives 10, 11, and 12. These volumes can be calculated by applying the average volume per acre to the unit acreage within the proposed action alternative. The volume has been adjusted for the various silvicultural systems described in Chapter 3. Additional information on the calculation of harvest volume is provided in the Control Lake Inventory Report (1993). Table 4-26 also includes estimated volumes associated with road clearing.

Table 4-26
Proposed Harvest Volume by Alternative

	Total Volume[1/] (MBF)			
	Alternative 1	Alternative 10	Alternative 11	Alternative 12
Unit Volume	0	37,773	89,296	107,718
Road Volume	0	2,081	4,727	5,610
Total Volume	0	39,814	94,023	113,328

1/ Adjusted for silvicultural systems and 17 percent hidden defect, breakage, and utility deduction.

Proposed Harvest by Silvicultural System

The existing successional stage will be altered by the proposed silvicultural treatments. Even-aged silvicultural cutting practices will result in the conversion of mature and overmature stands to seedling stands. This process will occur on all sites except those that are proposed for uneven-aged management or overstory removal. Overstory removals will result in conversion of the existing stand to an immature stand. The post-harvest successional stage, for all harvest

types and particularly uneven-aged treatments, will be dependent upon the plant community, the retained canopy structure (harvest design), and advance regeneration.

Species composition will change from an existing condition to a managed condition. Future condition on some sites is expected to consist of a lower composition of cedar. Studies indicate that other conifer species can out compete the cedars on sites which are most preferred by cedar (Forest Health Management Report, USDA Forest Service, 1992). Other sites may produce higher amounts of understory vegetation which can also affect species composition, seedling survival, and growth.

Table 4-27 summarizes the use of Project Area silvicultural systems for Alternatives 10, 11, and 12. The number of units utilizing the silvicultural system; of which some units use 2 or more, are shown along with the total number of acres in the alternative. Levels of snag and green tree reserves for individual units are included in the unit prescription (Appendix H in the Draft EIS).

Table 4-27
Proposed Harvest by Silvicultural System and Alternative

	Alternative 1		Alternative 10		Alternative 11		Alternative 12	
	Units	Acres	Units	Acres	Units	Acres	Units	Acres
Clearcut[1/]								
Type A	0	0	18	740	47	1,558	61	1,180
Type B	0	0	13	309	30	928	37	1,073
Type C	0	0	3	93	7	217	8	223
Total Clearcut	0	0	33	1,141	84	2,703	106	3,106
Overstory Removal (Type E)	0	0	1	6	6	117	10	327
Seed Tree (Type F)	0	0	2	21	1	23	4	91
Shelterwood (Type G)	0	0	3	88	1	327	12	380
Shelterwood (Type H)	0	0	1	12	2	28	2	28
Uneven-aged Mgmt. (Type I)	0	0	4	13	18	416	25	520
Total[2/]	0	0	38	1,281	98	3,612	159	4,452

1/ Type D clearcut acreages are included under other harvest types.

2/ Number of units includes partial units.

Table 4-28 describes the spatial distribution of harvest types across the Project Area by VCU for Alternatives 10, 11 and 12. No harvest is proposed within the Project Area for Alternative 1.

Proposed Harvest Methods

The harvest methods proposed for the action alternatives were selected from systems available and in use in or near the Project Area. The systems were selected on a setting basis after site visits and critical profile analyses were performed to determine the most efficient system while still meeting Forest standards and guidelines. The majority of the settings proposed for harvest are designed to achieve at least partial suspension of the logs while yarding. Therefore, there is a significantly higher percentage of skyline systems than historically has been used in the Project Area. This is due to the increased stream and soil protection which these systems allow, and is required by TLMP.

Shovel logging is being used more frequently in the Project Area due to its efficiency. Limited shovel logging is proposed; however, there may be more opportunities to use this system than

Table 4-28

Proposed Harvest by Silvicultural System1/, VCU, and Alternative

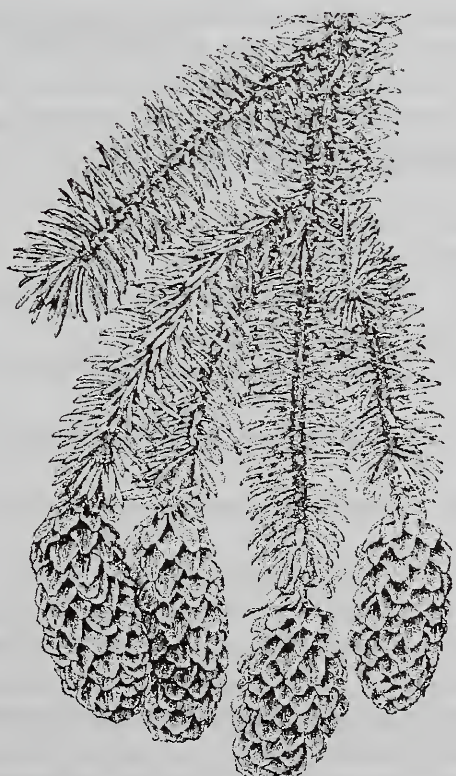
VCU	A	B	C	E	F	G	H	I	Total
	Alternative 10 Silvicultural Harvest Types								
574	0	0	0	0	0	0	0	0	0
575	0	0	0	0	0	0	0	0	0
576	0	0	0	0	0	0	0	0	0
577	0	0	0	0	0	0	0	0	0
578	0	0	0	0	0	0	0	0	0
591	0	0	0	0	0	0	0	0	0
592	0	0	0	0	0	0	0	0	0
593	0	0	0	0	0	0	0	0	0
594	91	20	48	0	0	0	0	0	159
595	217	111	0	6	0	54	0	0	389
596	30	0	0	0	0	0	0	0	30
5971	0	9	0	0	21	33	0	7	70
5972	402	168	45	0	0	0	12	6	633
Total	740	309	93	6	21	87	12	13	1,281

VCU	A	B	C	E	F	G	H	I	Total
	Alternative 11 Silvicultural Harvest Types								
574	0	0	0	0	0	0	0	0	0
575	117	3	0	0	0	0	0	87	238
576	0	0	0	0	0	0	0	0	0
577	38	0	0	85	0	0	0	33	156
578	32	0	0	0	0	80	0	23	134
591	40	0	0	0	0	21	0	0	61
592	0	0	0	0	0	0	0	0	0
593	102	74	0	0	0	53	0	0	229
594	219	284	118	0	0	40	0	55	716
595	320	254	0	6	23	54	0	63	719
596	121	27	54	5	0	78	16	52	353
5971	0	29	0	0	0	0	0	0	29
5972	570	227	45	21	0	0	12	103	978
Total	1,558	928	217	117	23	327	28	416	3,612

1/ Type D clearcut acreages are included under other harvest types.

Table 4-28 (continued)
Proposed Harvest by Silvicultural System,[1] VCU, and Alternative

	Alternative 12 Silvicultural Harvest Types								
VCU	A	B	C	E	F	G	H	I	Total
574	3	0	0	13	0	0	0	0	16
575	237	125	6	0	59	25	0	87	539
576	0	0	0	0	0	0	0	0	0
577	63	13	0	85	0	0	0	33	194
578	32	0	0	0	0	81	0	23	136
591	40	0	0	0	0	21	0	0	61
592	0	0	0	0	0	0	0	0	0
593	151	74	0	167	0	53	0	72	517
594	250	285	118	0	0	40	0	55	748
595	317	255	0	36	23	54	0	79	764
596	130	27	54	5	0	78	16	52	362
597.1	17	68	0	0	9	4	0	11	109
597.2	570	226	45	21	0	24	12	108	1,006
Total	1,810	1,073	223	327	91	380	28	520	4,452



shown. Small portions of cable settings potentially could be suited to shovel logging. This determination would occur during the final layout.

Helicopter logging is specified in each alternative. This system was only selected on settings where conventional logging systems were not feasible. None of the helicopter settings have any additional road construction associated with them over what is existing or specified for the conventional harvested settings. However, several of these units depend on other units being harvested for developing adequate landings.

Table 4-29 displays the distribution of proposed yarding systems for the action alternatives. Running skyline is the dominant logging system proposed in all alternatives followed by live skyline, slackline, helicopter, highlead, and shovel yarding.

Table 4-29
Distribution of Proposed Harvest Systems by Alternative

	Alternative 10		Alternative 11		Alternative 12	
Harvest System	Acres	%	Acres	%	Acres	%
Highlead	308	24	559	15	670	15
Running Skyline	338	26	1,242	34	1,706	38
Live Skyline	195	15	530	15	530	12
Slackline	181	14	361	10	496	11
Shovel	81	6	376	10	445	10
Helicopter	177	14	544	15	605	14
Totals	1,281	100	3,612	100	4,452	100

Proposed Harvest Unit Size

The NFMA limits the size of a forest opening that may be created based on the forest type. For the coastal Alaska western hemlock/Sitka spruce forest type, the maximum created opening size allowed is 100 acres. Under the NFMA, this opening size may be exceeded where large units will produce a more desirable contribution of benefits. The NFMA and the Alaska Regional Guide (USDA Forest Service, 1983) provide the following factors and guidelines to be considered for permitting a larger unit size:

1. Topography

2. Relationship of units to other natural or artificial openings and proximity of units

3. Coordination and consistency with adjacent management areas

4. Effect on water quality and quantity

5. Visual adsorption capacity

6. Effect on wildlife and fish habitat

7. Regeneration requirements for desirable tree species, based upon latest research

8. Transportation and harvesting system requirements

9. Natural and biological hazards to the survival of residual trees and surrounding stands

10. Relative total costs of preparation, logging, and administration of harvest cuts

Where it is determined by the interdisciplinary team that exceptions to the size limitation are warranted, the actual size limitation of openings may be up to 100 percent greater for factor 9 and up to 50 percent greater for all other factors with the approval of the Forest Supervisor. Forest Supervisors will identify the particular conditions under which the larger size is warranted and explain the benefits to be gained.

Exceptions to the 100-acre size limit in excess of 50 percent greater (100 percent greater for factor 9) are permitted on an individual timber sale basis after 60 days public notice, and review and approval by the Regional Forester.

The Alaska Regional Guide also describes the minimum stocking guidelines required in order to change the created opening status of a harvested unit. Created openings will be adequately stocked with desirable tree species of specified height before the area will no longer be considered an opening. This requirement will effect the limitations on scheduling, locations, and size of additional created openings on National Forest System lands. The basis for this determination will be the third year silvicultural survey.

The pool of potential harvest units contain 6 units greater than 100 acres (Table 4-30). This includes one unit (574-444) and portions of others which are proposed for uneven-aged management. The created opening size may be smaller than the unit size due to partial cutting practices and the retention of reserve tree patches within units. Mitigation includes adjustment to unit boundaries, selective harvest over part of the unit, or retaining buffer strips to reduce the effective size of the created opening to approximately 100 acres. As shown, only 3 of the 6 units have created openings larger than 100 acres and require the approval of the Forest Supervisor. The reasons for maintaining the size of these units greater than 100 acres are factors 1, 7, 9, and 10 listed above.

Table 4-30
Units Greater than 100 Acres

Unit Number	Unit Acres	Harvest Type/Mitigation Measure	Approximate Created Opening Size (Acres)
578-401	102	Shelterwood harvest (Type G) with selective harvest (Type I) lake buffer	95
593-424	104	Overstory removal (Type E)	104
596-416	101	Clearcut (Types A and B); Shelterwood (Type H) in southeast portion	101
597.2-414	112	Clearcut (Type A)	112

Operability

The percentage of acres harvested from each operability class (Normal, Difficult, and Isolated) is shown in Table 4-31.

Indirect Effects

Successional Stages and Associated Stand Management

Following harvest, the managed forest will go through distinctive successional stages. Removal of the forest overstory alters the microsite conditions that influence density and species composition of the understory vegetation. Different components dominate the stand at different stages, and the overall forest structure will change as the new stand develops. The level of change will depend on the type of silvicultural treatment applied during harvest and subsequent treatments applied during stand development. Characteristics such as tree height,

diameter, and overall stand productivity will vary according to site class. However, second-growth stands commonly show less variability in tree diameter and height than the old-growth stands they are replacing. The following stages are generally applicable to even-aged treatment types.

Table 4-31
Normal, Difficult, and Isolated Acre Projections by Alternative

Operability Class	Existing %	Alternative 10 %	Alternative 11 %	Alternative 12 %
Normal	78	86	85	86
Difficult	19	14	15	14
Isolated	3	0	0	0

Conifer Regeneration Stage (0 to 5 years)

A variety of shrubs, herbs and grasses will dominate the site during this period following harvest. These species will invade favorable microsites through vegetative reproduction and seedling establishment in the first growing season following harvest. Species adapted to increased solar radiation will out compete those adapted to lower light levels (shade tolerant). Conifer seedling establishment is dependent upon microsites favorable to each particular species. Conifer growth may be slow on sites where salmonberry, alder or other invading species are present on the site. Understory development will increase along the edge of adjacent stands because of the additional sunlight available to those areas.

Species that thrive best in the shaded and protected environment of the mature forest, such as some mosses, lichens, forbs, and shrubs, would likely have a reduced presence in the new stand. Other species such as huckleberry, salmonberry, and western hemlock survive as understory species, but become vigorous competitors for space when the canopy is removed and additional light is available.

Hemlock will generally be the dominant conifer species to become established because its shade tolerant and competitive characteristics usually lead to an abundant seed source. Sitka spruce regeneration does not reproduce well in the understory, but will more commonly occur and develop rapidly from seed in open conditions. Although western red cedar germinates well on mineral soil, there are a host of other species in southeast Alaska that compete better on disturbed soil (USDA Forest Service, 1992). Western red cedar seedling mortality rates are usually high, particularly when exposed to full sunlight. Alaska yellowcedar is not expected to be a significant component of the new stands partially because of poor seeding abilities and slow growth. Like western red cedar, Alaska yellowcedar germinates well on mineral soil, but is the poorest competitor for establishment among local conifer species. Greater cedar regeneration may occur on sites with a high cedar composition prior to harvest or those sites which have retained cedar advanced regeneration or Seed Trees during harvest. Western red cedar is favored on warmer sites with longer growing seasons, where Alaska yellowcedar is favored on cooler sites with a shorter growing season.

The number of seedlings established per acre at the end of this stage is determined by seed availability and the number of microsites favorable for seedling establishment. The number of seedlings established could range from several hundred to several thousand per acre.

Where nonmerchantable trees are retained in the unit, the quantity of reserve trees left controls the overall appearance of the site. Groups of smaller diameter understory trees may be retained in areas for wildlife or visual protection. Depending on the number of reserve trees on the site, these units can have the appearance of a partial cut. The reserve trees provide some diversity in forest structure throughout the life of the next stand.

Seedling/Sapling Stage (6 to 25 years)

Understory production of woody species is at its highest at this stage, especially in *Vaccinium*-dominated sites. Larger dead materials from the original stand continue to decompose. If the stocking level is high and the site is productive, initiation of crown closure occurs. The initiation of crown closure is dependent upon the number of trees established per acre during the first (0 to 5 year) stage. Management recommendations suggest implementing a precommercial thinning near the end of this stage because competition for growing space begins to reduce growth rates.

On productive sites, such as a western hemlock/shield fern plant association, crown closure will occur during the mid-to late-portion of this stage. If precommercial thinning is not undertaken, this will result in a decline of shade intolerant shrubs, herbs, and grasses, and conversely a gradual increase in the proportion of shade tolerant understory species. If the stand is precommercially thinned, the shade intolerant shrub species would be retained until crown closure occurs midway through the next stage. On lower quality sites, crown closure may not occur until the very end of this stage or possibly the beginning of the next stage.

Management guidelines on the Thorne Bay Ranger District request that spruce and cedar species be given preference when selecting species to retain during thinning. This selection process will result in reducing the stocking level of hemlock by a larger percentage than other species in the stand.

Pole/Young Sawtimber Stage (26 to 50 years)

Tree growth during this stage is characterized by accelerated height and crown growth. Crown closure will be completed for most site classes and forest types. This stage is often referred to as the understory exclusion stage because understory vegetation will decrease as closure occurs. The overstory structure will generally remain uniform across the stand, yet differences in crown class will occur among individual trees due to competition. If reserve trees have been left in the unit, the overstory structure will appear very broken or non-uniform.

When stands have been precommercially thinned, they may provide winter habitat for deer. This is because the delay in crown closure has enabled understory forage to persist and the larger diameter branches produced after thinning will hold greater amounts of snow in the canopy, and provide increased thermal cover.

If these stands have not been precommercially thinned, there will be less understory vegetation present. The appearance of the overstory canopy structure depends upon the quantity and placement of reserve trees within the unit. Increased competition for growing space begins to lead to suppression of trees under the main canopy and some natural mortality.

Crown closure may not occur in all types of stands. The low volume Hemlock-Cedar and the Mixed Conifer plant associations will often retain an open crown structure throughout the rotation.

Young Sawtimber Stage (51 to 100 years)

For most forest types, this stage will be dominated by crown and height differentiation with increased stand volume growth. Less vigorous trees will be overtopped by superior trees creating an overstory canopy with more depth. Suppressed trees will continue to die in the understory canopy allowing adjacent trees to use the light and nutrients made available.

Mosses will begin to colonize the forest floor as the type of understory shrubs present is reduced to shade tolerant species. Occasional openings may be created in the overstory through windthrow or individual tree mortality. This will provide some additional light to the forest floor to retain patchy shrub growth. The appearance of the overstory canopy structure is dependent upon the quantity and placement of reserve trees within the unit. Reserve trees assist the stand in developing old-growth characteristics at a younger age.

Depending on the site quality and stocking level, tree growth will begin to slow towards the end of this stage. Opportunities exist early in this stage to commercially thin the stand and concentrate growth on fewer trees. If the stand is not thinned, diameter, height, and growth rates may decrease. Regeneration harvest in the Control Lake Project Area typically will occur at the end of this stage, at about 100 to 120 years of age.

Commercial thinning during this stage can provide a flow of harvest volume, while providing benefits such as increased growth, species and structural control, and windfirmness. A variety of techniques may be used to prepare the stand for future treatment or desired habitat conditions, particularly for wildlife.

Mature Sawtimber Stage (100 to 250 years)

At this stage the mature stand structure created in the previous stage will become more diverse. The stand will begin to develop the structural characteristics usually associated with old-growth stands.

Mortality among trees in the overstory begins to occur, leaving small openings. This allows light to reach the forest floor and helps in the establishment of understory vegetation, including conifer seedlings. The stand slows in growth and vigor but still produces higher volumes per acre than the previous stages. Reserve trees from the previous regeneration harvest no longer dominate the overstory. Structural diversity increases in both the understory and overstory, and is greater than at any previous stage.

Commercial forest stands in the Control Lake Project Area generally will reach the mature sawtimber stage only if stands are designated for harvest under extended rotation management. Currently all suitable forestland is expected to be harvested at approximately 90 to 140 years, depending on the site quality and timing of intermediate stand treatments.

Forest Health

Timber harvesting within the Control Lake Project Area will result in the reduction of the number of stands with slow or declining growth rates due to decay and western hemlock mistletoe. Harvesting stands in declining health and replacing them with young vigorous stands will reduce the volume loss associated with decays and increase the growth and yield of the managed forestland across all action alternatives. From the perspective of timber management, the health of the timber stands is increased through harvesting. However, many insects and pathogens also contribute significantly to ecosystem diversity and long-term stability in old-growth stands by providing increased canopy diversity and animal habitat in the form of snags and small openings.

Harvest of the proposed unit pool will have no measurable effect upon the overall forest pest populations. Although partial cutting activities may benefit stand health in the form of stocking control, it could be negated through basal damage if preventive care is not taken during logging operations.

Dwarf Mistletoe

Management and control of dwarf mistletoe includes removal of infected trees through clearcutting. Regeneration in previously clearcut harvested areas appears to be generally free of mistletoe, although it usually takes 10 years before mistletoe becomes evident in young stands. Mistletoe spreads slowly to regenerated stands, from adjacent infected stands. Planting tree species resistant to mistletoe infection, such as spruce and cedar, can reduce impacts and control the spread from adjacent areas. Generally, there is little volume loss throughout the rotation if the stand does not suffer growth losses from heavy infection at an early age. Thinning treatments can be used to reduce the presence of mistletoe in the stand.

The total acreage of mistletoe-infected stands will be reduced by harvesting currently infected stands. However, the spread of dwarf mistletoe into young hemlock stands is most often the result of leaving infected hemlock standing within and adjacent to harvested areas (Shaw, 1982). Rates of spread will be greater in partially cut stands where infected western hemlock have been retained. Stands that currently have mistletoe and would benefit from the proposed harvest can be identified from the unit cards and silvicultural prescriptions in Appendices F and H.

General Decays

Both western hemlock and spruce are thin-barked species and very susceptible to damage from logging activity. Although the proposed harvest of the unit pool is not expected to result in an increase in stem and root decays, partial cutting or thinning practices can increase the presence of decays if species selection criteria and/or careful logging practices are not accomplished. If significant numbers of trees are damaged during harvest activities, the retained stand should be harvested within 5 years, so that decay induced by logging damage will result in little loss to merchantable volume. Planting tree species resistant to specific root decays will control root decay pathogens within a stand.

Western Hemlock Canker

The presence of western hemlock canker can be expected to increase slightly with the increased development of roads and vehicle traffic within the Project Area. The presence of this pathogen and its dispersal has been attributed to gravel roads with high vehicular traffic. The damage associated with this pathogen is primarily restricted to the lower branches of western hemlock trees within 100 feet of the roads. This results in a loss of visual quality immediately adjacent to the road. Western hemlock canker may cause regeneration mortality, although the cankers' influence on the growth of young stands is not well documented.

Hemlock Fluting and Alaska Yellowcedar Decline

Harvest within the Control Lake area is not expected to change the presence or spread of hemlock fluting or Alaska yellowcedar decline. Studies have not shown that these forest pathogens are influenced by the presence or type of harvest that is expected to occur. However, the regeneration of Alaska yellowcedar needs to be specifically considered where it forms a significant component of a site proposed for harvest. The harvesting of old-growth forests through large clearcuts has resulted in a reduction of the Alaska yellowcedar component.

Windthrow

There will be an increased possibility that more windthrow will occur throughout the Project Area as harvest levels increase and exposed stand edges are created. Stands that are less susceptible to windthrow have developed with an open canopy structure that allowed individual trees to become windfirm in response to wind stress. Even-aged silvicultural practices increase the likelihood of blowdown by increasing the amount of previously unexposed standing timber exposed to the winds.

Since windthrow is a stochastic event, its occurrence, placement, and timing across the landscape is unpredictable. However, localized conditions (soil, hydrological, or topographical) were considered to predict potential windthrow within and adjacent to proposed harvest units. Units were designed in the field with considerations for windthrow, and boundaries and buffers were adjusted to mitigate these effects.

The strongest winds come from the southwest and southeast; therefore, windthrow is most likely to occur in mature stands with uniform and dense crown structures along the north edge of clearcut units. Partial cutting techniques which remove less than 30 percent of the overstory are more wind resistant than other silvicultural practices (Harris, 1989). However, if the basal area removed exceeds 30 percent, partially cut stands may also suffer wind damage. This project has incorporated much of the information that is available to design units in a way to minimize the potential for windthrow after harvest.

Reforestation

Natural regeneration is still used to restock most units harvested; however, hand-planting of Alaska yellowcedar is practiced where the yellowcedar component is desired, but would have a low likelihood of survival with natural regeneration methods. Cedar silviculture is problematic, and to be successful it will probably require a variety of techniques. Available data suggests that clearcutting will not consistently regenerate these species. The autecology of cedars suggest that partial cutting may be more useful in maintaining cedars as a viable timber resource (USDA Forest Service, 1992).

Precommercial Thinning

Natural regeneration often results in overstocked stands. Precommercial thinning (PCT) is designed to improve future growth by reducing stand density, thus also reducing the competition between trees for sunlight, moisture, and nutrients. The method for thinning any particular stand is based on the characteristics of the site and the objective of moving the stand toward the desired future condition. Thinning is classified as precommercial when there is no commercial wood utilization. This treatment would need to be performed on stands approximately 15 to 25 years following harvest. The highest priority for thinning would be given to the stands with the highest average site index. Thinning guidelines designed to meet timber production goals generally target trees based on genetic and structural dominance. The spacing guidelines for PCT timber production objectives varies by site index, with the widest spacing on the highest site class lands.

Cumulative Effects

Cumulative effects are those that result from the incremental effect of the action when added to the past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. This section summarizes the impacts of the Control Lake proposed harvest upon the environment in combination with the effects of past and proposed future actions.

Past Harvest

The earliest commercial timber harvest on central Prince of Wales Island was limited to easily accessible coastal shorelines. Development of the logging road system marked the beginning of intensive land-based efforts. Table 4-32 displays the area logged since 1940 and includes harvest to the full implementation of the 1989-1994 EIS.

Projected Harvest Through 2004

The 1997 TLMP Revision reduces the size of the suitable forest land base to approximately 26,545 acres. Only 22,786 acres of this area is in old growth. This will result in a corresponding reduction in the amount of sawtimber volume available for future harvest. The Ketchikan Area 10-year sale program does not project a second entry into the Control Lake Project Area before 2004. The proposed harvest under Alternative 12 contains the maximum harvest volume for the operating period. Any units that have been field verified and are not harvested under the selected action alternative may potentially be selected during another entry for harvest.

Table 4-32
Acres of Previous Timber Harvest

Harvest Period	Acres Harvested
1940 to 1949	20
1950 to 1959	40
1960 to 1964	30
1965 to 1969	2,337
1970 to 1974	25
1975 to 1979	187
1980 to 1984	244
1985 to 1989	3,115
1990 to 1994	4,605
Total	10,603

Source: GIS query, USDA Forest Service, TNF

Cumulative Harvest Through 2054

The predicted effect of harvest on the Control Lake Project Area and future timber harvest activities on central Prince of Wales Island is to achieve the proposed desired future condition for each LUD as described in the Forest Plan Revision. Areas that allow timber harvest will result in the conversion of a large percentage of mature forests to early successional stages.

Table 4-33 shows the average annual past and proposed timber harvest from 1940 through 2054. A maximum harvest alternative (Alternative 12) for Control Lake has been substituted for the Forest Plan acres for the 1998 to 2004 period to represent the acres that have been field verified for harvest.

Table 4-33
Average Annual Timber Harvest Acres from 1940 through 2054

	Average Annual Harvest Acres
Pre-harvest Condition (pre-1940)	0
Past Harvest (1940 to 1997)	183
Proposed Harvest (1998 to 2004)	636
TLMP (2005 to 2054)	367

Timber Supply

Approximately 22,786 acres of old growth remain in the suitable forest land base of the Project Area, which would be harvested between now and the year 2054. This includes the acreage to be harvested under the Control Lake Sale, which varies under the action alternatives from 1,281 acres (Alternative 10) to 4,452 acres (Alternative 12). It is estimated, based on TLMP 1997 numbers updated for current land ownership, that harvest will occur at the rate of approximately 367 acres per year. The projected harvest reflects the Control Lake Project Area's estimated contribution to an average Annual Sale Quantity (ASQ) of approximately 267 MMBF for the Tongass National Forest (TLMP, 1997).

Since 1979, additional land use interests and resource information have influenced Forest Service management direction. Road building associated with timber harvest has led to increased levels of State selection of land for residential communities, removing these lands from the National Forest System. Increased access has also led to increased demand for recreational opportunities, including both developed and undeveloped settings. Increased knowledge of the effects of management activities has led to changes in standards and guidelines and BMP's in order to protect valuable fisheries, wildlife and forest resources. The actual rate and acres of future harvest are expected to vary from the estimate provided above due to the additional multiple use demands on, and increased natural resource knowledge of, the Forest System land base.

Mitigation

Mitigation of proposed timber harvest activities began with the resource surveys and unit design field work conducted during the summer of 1993.

The mitigation of proposed timber harvest activities includes the design of alternative harvesting strategies, adjustment to unit boundary layout, and placing limitations on harvest scheduling where other resource concerns were identified. Buffers have been placed along streams and lakes in accordance with the Forest Plan standards and guidelines. Prevention and mitigation of blowdown was developed using techniques described in the Southeast Alaska Guide for Reducing Wind Damage (Harris, 1989). The applied techniques use unit design and harvest prescriptions, which incorporate reserve trees around the perimeter of the unit, to reduce risk.

The following silvicultural practices have also been implemented to mitigate the effects of timber harvest. Partial cutting, in the form of Seed Tree; Shelterwood; and group selection harvest, are used to enhance stocking, relative vigor, and species composition where it is appropriate In some units, the silvicultural prescriptions require that cedar be retained within the unit or along unit boundaries. This is expected to improve the potential for increasing the cedar regeneration within the units where it may be out competed by other species. In order to maintain the high abundance of Alaska yellowcedar, reserve trees are often prescribed to provide seed and shelter for yellowcedar regeneration. Harvest units where this measure would apply currently sustain

moderate to high levels of Alaska yellowcedar and have plant associations that favor Alaska yellowcedar growth. Units that incorporate specific mitigation measures are identified on the unit cards and in the silvicultural prescriptions.

Monitoring

Project-specific monitoring is recommended as an ecosystem management measure to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees, and the four types of partial cutting and uneven-aged management techniques prescribed for the Control Lake Project Area units. Monitoring should determine the degree that reserve tree blowdown occurs and how this blowdown is affected by site factors. Monitoring should also examine regeneration and stand development following each harvest type.

This page left intentionally blank.

Wildlife

Key Terms

Habitat—the sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat capability—an estimated number of animals that a habitat can sustain.

Management Indicator Species (MIS)—species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management activities.

Viable population—the number of individuals of a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations, well distributed throughout their range in the national forest.

Wildlife Analysis Area (WAA)—division of land identified by the Alaska Department of Fish and Game (ADF&G) and used by the Forest Service for wildlife analysis.

This analysis considers the direct, indirect, and cumulative effects of the alternatives proposed for the Control Lake Project. Effects are projected to 2004, the anticipated end of the proposed action and to 2054 to show the cumulative impacts of past, proposed, and scheduled harvest generally corresponding to the conversion of wildlife habitat.

Wildlife Habitats

Wildlife species are individually adapted to combinations of plant community types and successional stages. Changes in plant communities or successional stages may result in changes in animal communities. Generally, the more diverse the vegetation, the greater the abundance and variety of wildlife species in an area. The probability of maintaining viable populations increases if suitable habitat is present in sufficient types, amounts, and spatial arrangements on a landscape level. Changes in forest cover types or successional stages occur as a result of natural and human caused disturbance. Timber harvest may add to, or detract from, the diversity of an area depending on existing conditions and the type and amount of harvest planned.

The effects of the proposed alternatives differ for various groups of wildlife in relation to their habitat requirements, feeding habits, and interaction with humans. Wildlife species used to gauge the impact of proposed alternatives include MIS and Threatened, Endangered, and Sensitive species that are potential inhabitants of the area.

Timber harvest and road construction are the principal activities likely to generate direct, indirect, and cumulative effects on wildlife in the Control Lake Project Area. Effects on wildlife from trapping, hunting, and recreational activities are indirectly tied to the type and magnitude of timber harvest. Timber harvest and road construction have the potential to affect wildlife resources through (1) habitat alteration, (2) disturbance from project activities, and (3) increased post-harvest human access. Greater public access in turn increases the vulnerability of game animals to hunting and of furbearers to trapping, and may cause shifts in species traditional use patterns.

Forest Successional Habitats

Table 4-34 presents the percentage of total acres harvested by silvicultural treatment (see *Silviculture, Timber, and Vegetation* section in Chapter 3 for detailed descriptions of silvicultural prescriptions). Type A through C regeneration harvest would convert old-growth habitat to an early successional stage. Structure would be left in these units in the form of individual and small groups of green trees and snags with little rot. Commercial timber volume would not be retained by canopy cover; retention would be on the order of 2 percent and 10 percent, respectively. Harvest Types E and F will leave greater amounts of volume, up to approximately

10 percent. Canopy cover retention would be on the order of 12 percent. Harvest Types H, G and I would have the appearance of partial cuts, with Type I retaining the highest level of structure within the unit. Harvest Type D includes islands or fingers of old growth within the unit. The acreage of this type is included within the acreages of the other types in Table 4-34.

Table 4-34

Proposed Silvicultural Treatments

Silvicultural Treatment[1/]	Harvest Type	Estimated % Volume Retained	Estimated % Canopy Cover Retained	% of Acres Proposed for Harvest Alt. 10	Alt. 11	Alt. 12
Type A	Regeneration	0	2	58	43	41
Type B	Regeneration	5	7	24	26	24
Type C	Regeneration	0	10	7	6	5
Type E	Overstory Removal	10	12	1	3	7
Type F	Seed Tree	10	12	2	1	2
Type G	Shelterwood	30	30	7	9	9
Type H	Shelterwood	50	50	1	1	1
Type I	Uneven-aged	70	70	1	12	12

1/ Type D clearcut acreages are included under other harvest types.

The effects of old-growth habitat loss on old-growth associated species are reflected in *Habitat Capability for MIS* in this section. Under natural ecological processes, the proposed units would begin to recover their old-growth characteristics approximately 150 years after harvest. However, the average rotation age for harvested stands would be 100 years, with stands located on less productive sites requiring a longer rotation age (up to 150 years) to reach a desirable merchantable volume. It takes 150 to 250 years before even-aged stands begin to develop more uneven-aged forest composition and heterogeneous understory (Alaback, 1984). Considerably more time is required to develop diversity of snags and large accumulations of large diameter woody debris in various stages of decomposition. Three hundred years or more may be required to create old-growth on productive sites, and less productive sites may take even longer (Alaback, 1984). Since it can be assumed that the managed stands within the Control Lake Project Area would be reentered and harvested as second growth, these forest stands would never develop the amount of decadent and dead material typically associated with old-growth forest. Additionally, understory production would remain low up to the time of the second harvest. However, the proposed retention of structure within managed stands would continue to provide some of the characteristics exhibited in old-growth forests (see *Effects on Snag Density by VCU* in this section).

Additional old-growth habitat would be cleared for construction of roads proposed under the action alternatives. Alternative 12 would harvest the most old growth for roads, while Alternative 10 would harvest the least. As described in the *Transportation and Facilities* section of Chapter 4, these roads would provide access for future harvest entries; therefore regeneration of old-growth characteristics would not occur.

An assessment of fragmentation as it relates to interior habitat, patch size frequency, and distribution is discussed and displayed in the *Biodiversity* section of Chapter 4.

Special Wildlife Habitats

Implementation of the action alternatives would result in some harvest of special wildlife habitats, including riparian. Site-specific information has been used to design wildlife units which ensure implementation of legislated protective measures, Forest-wide Standards and Guidelines, BMP's, and unit-specific mitigative measures. Through this process, adverse effects to remaining acreages of special wildlife habitats are reduced or eliminated.

Beach Fringe and Estuary

No harvest is planned within the 1,000-foot Beach and Estuary Fringe based on Forest Plan Standards and Guidelines. There would also be no construction of roads through these areas.

Riparian Management Areas

Riparian habitat was identified by the boundaries of the Riparian Management Area, as defined in the Riparian Standards and Guidelines. Harvest planned within these areas is discussed in the *Wetlands, Floodplains, and Riparian Areas* section of this chapter.

Management Indicator Species

As discussed in the *Affected Environment* section, the TLMP Draft Revision (1991a) MIS models were used to estimate the capability of habitats to support selected wildlife species. The model results are intended to provide a relative comparison among the effects of the alternatives, not to predict actual population numbers. In keeping with the intended use of the habitat capability model data, the Supplemental Draft EIS tables present only the relative habitat capability, expressed as a percentage of the 1954 (prior to commercial harvest) capability.

The TLMP Revision (1997) discontinued use of habitat capability models, with the exception of a modified deer model. Other wildlife species were evaluated through a series of species assessments prepared by expert panels. Although the TLMP Revision (1997) estimated effects on all species at the Forest-wide level, rather than Project-specific level, it predicted effects that are consistent with those described in this Supplemental Draft EIS. As of late 1997, an interagency group has agreed to develop use modified habitat capability models for deer, wolf, black bears, and marten. These are planned to account for harvest methods that are alternatives to clearcutting and will use a new timber volume strata.

Both the TLMP Draft Revision (1991a) deer model and the Draft TLMP Revision (1996) deer model were used to evaluate timber harvest proposed under the Lab Bay Sale (USDA Forest Service, 1997), which is just north of the Control Lake Project Area. Both models showed decreasing habitat capability between 1954 and current conditions, with the 1997 model showing a decrease about three times greater than the 1991 model. Habitat capability decreases under the action alternatives were similar under both models, in terms of their percent change. By the year 2054, habitat capabilities decreased under both models, with the 1997 model showing a somewhat larger effect. The Control Lake Supplemental Draft EIS presents the results of the 1991 deer model for the Control Lake Project Area and proposed alternatives. Based on the project-specific analysis performed for the Lab Bay Sale, it is expected that the 1997 deer model would reflect the same general trends of habitat capability reduction.

Increased human access could intensify harvest of marten, black bear, Sitka black-tailed deer, and Alexander Archipelago wolf through increased hunting and trapping pressure. Because the Project Area is accessible from communities on Prince of Wales Island via the road system, and from other Southeast Alaska communities via the Alaska Marine Highway System, a road access management plan was developed. This plan is designed to mitigate the potential effects of increased hunting and trapping pressure. Closures were proposed on a road-by-road basis depending on resource values and other management activities. Table 4-35 displays the current road densities for the Project Area and the road density with closures under the action alternatives.

Table 4-35
Road Density by Alternative

Alternative	WAA	Road Density	Open Road Density After Closures
Alt. 1	1318	0.78	0.78
(Current)	1319	0.91	0.91
	1323	0.19	0.19
	1421	0.45	0.45
	Project Area	0.67	0.67*
Alt. 10	1318	0.92	0.86
	1319	1.03	0.61
	1323	0.19	0.07
	1421	0.45	0.36
	Project Area	0.75	0.54
Alt. 11	1318	1.09	0.85
	1319	1.16	0.57
	1323	0.38	0.07
	1421	0.55	0.36
	Project Area	0.90	0.52
Alt. 12	1318	1.09	0.85
	1319	1.22	0.65
	1323	0.46	0.16
	1421	0.63	0.44
	Project Area	0.95	0.58

*No Action Alternative does not include implementation of Road Access Management Plan.

Alternative 1, the No Action Alternative, would not directly affect habitat capabilities for any MIS. Table 4-36 displays the expected changes in MIS habitat capability that would occur under the action alternatives, expressed as a percentage of the 1995 (current condition) habitat capability. Alternative 12 has the greatest potential to affect habitat capability for MIS, with estimated reductions as great as 9 percent (Table 4-36). Implementation of Alternative 10 would have the least effect on habitat capability, with most species remaining within one percent of existing conditions.

Table 4-36
Changes in MIS Habitat Capability, by Alternative

Species	% of 1997 Habitat Capability			
	Alt. 1	Alt. 10	Alt. 11	Alt. 12
Black-Tailed Deer[1/]	100	99	97	96
Black Bear[2/]	100	99	94	94
Wolf[1/]	100	99	96	96
Marten[1/]	100	99	97	97
River Otter	100	100	100	100
Bald Eagle	100	100	100	100
Vancouver Canada Goose	100	99	99	98
Red-breasted Sapsucker[1/]	100	99	96	95
Hairy Woodpecker[1/]	100	99	94	93
Brown Creeper[1/]	100	99	97	97

1/ Includes patch-size effectiveness reduction factor (see *Biodiversity* section).

2/ Includes disturbance reduction factor to account for disturbance to black bears associated with roads.

Direct effects on river otter and bald eagle have been avoided in all action alternatives through protection of beach fringe, estuary fringe, and riparian areas. The number of units affecting high quality MIS habitat is displayed in Table 4-37.

Table 4-37
Number of Units Affecting High Quality Habitat[1/] by Alternative

Species	Alternative			
	1	10	11	12
Black-tailed Deer	0	2	18	23
Black Bear	0	37	97	122
Marten	0	24	64	81
River Otter	0	0	0	0
Bald Eagle	0	0	0	0
Canada Goose	0	0	0	1
Red-breasted Sapsucker	0	32	90	113
Hairy Woodpecker	0	7	29	36
Brown Creeper	0	1	8	9

1/ Habitat suitability index (HSI) value for each unit meets or exceeds 0.5.

Sitka Black-tailed Deer

During severe winters Sitka black-tailed deer are dependent on low elevation, high volume, old-growth stands. Typically, the long-term quality of deer winter range is reduced by timber harvest. Clearcuts and second growth provide little snow interception above forage and, therefore, greatly increase effects of snow. Even in unlogged conditions, a deep-snow winter can kill many deer.

Under the action alternatives, between 2 units (Alternative 10) and 23 units (Alternative 12) located on high quality deer habitat would be harvested (Table 4-37). High quality deer winter range in the Elevenmile Block would be affected by harvest of units 593-408 and 419 (totalling approximately 93 acres). Harvest of up to 9 small units in the unit pool would affect high quality deer habitat in the south half of the Western Shoreline Late-successional Corridor.

Located immediately west of the Big Salt Block, unit 595-412 (88 acres) would substantially reduce and bisect a 140-acre patch of high quality habitat. The largest patch of highest quality habitat (rated 0.81 to 1.0) located within the Big Salt Block would remain unaffected.

The remaining harvest units affecting high quality deer habitat would be distributed primarily within the southeast portion of the Project Area, including 9 units proposed for harvest within the Drumlin portion of the Honker Watershed. Harvest within this area would result in reduction and fragmentation of existing high quality winter habitat patches.

Road density within the Project Area would increase from the current level of 0.67 to between 0.75 and 0.95 miles per square mile, depending on the alternative selected (Table 4-35). Increased road densities may increase hunter success with improved access. Although no specific recommendations exist for Southeast Alaska, black-tailed deer models developed in Washington indicate that road densities should be maintained below 2.5 miles per square mile to maintain habitat capability (Washington Department of Wildlife, 1987). Depending on the alternative selected, between 11 (Alternative 10) and 62 (Alternative 12) miles of newly constructed roads and 56 miles of existing roads are proposed for closure following completion of harvest activities. This would result in post-harvest road densities of between 0.52 and 0.58 miles per square mile within the Project Area (Table 4-35).

Twenty-five harvest units, located at least partially within high quality winter range, are proposed for thinning (see *Timber and Vegetation* section for a complete list of units). Recent studies indicate that thinning of second-growth stands prior to canopy closure prolongs the availability of preferred forage species (DellaSalla et al., 1993). The positive effects of thinning, however, may be short-lived without repeated thinning. Over the short-term, the more open canopy would also increase snow accumulation, causing a decline in winter habitat value for deer (Sigman, 1985). However, over the long-term (greater than 100 years), repeated thinning in managed stands may promote old growth structure, such as a multilayered canopy and large diameter trees (FEMAT Report, 1993). Units proposed to be thinned are located in high quality winter range stands of Volume Classes 6 and 7.

Black Bear

Effects on black bear habitat capability were reduced by avoiding harvest within beach fringe, estuary fringe, stream corridors, and riparian habitat for all action alternatives (see Table 4-36). VCU's that have been heavily harvested in the past, such as 577, 578, and 597.2, are currently limited in available cover. Timber harvest within these VCU's would further reduce habitat capability by enlarging existing openings.

Under the action alternatives, between 37 units (Alternative 10) and 122 units (Alternative 12) located on high quality black bear habitat would be harvested (Table 4-37). Specific units of concern include the cluster consisting of 597.2-449, 439, and 414 (totaling approximately 242 acres), and the cluster of 597.2-421, 418, and 417 (totaling approximately 97 acres), which are adjacent to two existing large openings and will further increase the size of these openings.

In areas not limited by available cover, timber harvest would increase acres of early successional habitat, providing high quality spring and summer foraging sites. Clearcuts would be expected to provide forage until the canopy closes, usually at 20 to 25 years, with tree cambium foraging continuing until the stands are about 40 years of age. Recent studies indicate that thinning of second-growth stands, prior to canopy closure, would prolong the availability of preferred forage species (DellaSalla et al., 1993).

Road density within the Project Area would increase to between 0.75 and 0.95 miles per square mile for the duration of harvest activities (Table 4-35). As described in the Subsistence section, additional road access would affect black bear populations by increasing hunter success (Kolenosky and Strathearn, 1987). After closures, open road densities will drop to between 0.52 and 0.58 miles per square mile.

Gray Wolf

The Alexander Archipelago wolf is closely linked to the Sitka black-tailed deer, its primary prey species; therefore, a decline in deer habitat would subsequently affect wolf populations. Timber harvest proposed under the action alternatives would affect habitat capability values as displayed in Table 4-36.

Open road densities should be maintained below 1.0 mile per square mile for the wolf, since they are believed to be intolerant of road densities exceeding this threshold (Suring et al., 1993). Suring et al. (1993) states that wolf populations are extremely vulnerable to harvest when road densities approach 0.93 mile per square mile. The TLMP Revision (1997) recommends that open road densities of 0.7 to 1.0 miles per square mile, or less, be targeted in areas where road access has been determined to significantly contribute to wolf mortality. Although implementation of an action alternative would increase road density within Project area WAA's, post-harvest road closures are proposed to maintain road densities below 1.0 mile per square mile. Depending on the alternative selected, overall open road densities would range from 0.52 to 0.58 mile per square mile after closure. It is anticipated that construction of any new roads into Honker Divide, even with implementation of an access management plan, will significantly increase trapping pressure and success within this area (D. Person, personal communication).

Several units proposed for harvest under Alternative 12 are of concern relative to the core use area of the Honker Divide pack (D. Person, personal communication). These include units 574-443 and 577-443, 426, 430, 431, and 432. Only units 577-431 and 432 are included in Alternative 11; none are included in Alternative 10. No units are proposed for harvest in the vicinity of known wolf dens.

Marten

The marten is an old-growth-associated species. Timber harvest proposed under the action alternatives would affect habitat capability as displayed in Table 4-36. The primary impacts to marten under each of the action alternatives would be a reduction in the long-term quality of marten cover due primarily to the loss of old growth and associated stand attributes (e.g., snags, down woody material), and an increase in road density throughout the Project Area.

Based on results of the 1991 TLMP Draft Revision (1991a) Habitat Capability Model, a maximum of 81 harvest units in the unit pool would affect high quality marten habitat, through the reduction of habitat and fragmentation of patches (primarily at their perimeters). Effects on habitat would be most apparent within the north and southeast portions of the Project Area, where the density of proposed units is highest.

Marten are easily trapped and are prone to overharvest, especially when trapping pressure is high. An increase in road density, particularly when located through marten travel corridors and foraging areas, would increase human access and the risk of trapping mortality. The marten habitat capability model (Suring et al., 1992) indicates that marten habitat capability declines precipitously as road densities increase above 0.2 mile per square mile. Therefore, the action alternatives would lower habitat capability beyond the declines from habitat reduction alone. Although the overall road density is similar among the alternatives, effects to marten would vary depending on road densities specific to individual populations. The access management plan is designed to reduce exposure of wildlife populations to increased hunting and trapping resulting from increased road densities.

As noted in Chapter 3, *Affected Environment*, the TLMP Revision (1997) includes a Forest-wide program to conserve and provide habitat to assist in maintaining long-term sustainable marten populations. The new Standards and Guidelines include special features for protection of high quality marten habitat in higher risk biogeographic provinces. These Standards and Guidelines will be implemented for the Control Lake Project Area VCU's 577 and 597.2, to the extent determined by an interagency team. In addition, retention of snags and downed material within units (see Chapter 3, *Vegetation and Timber Resources*, on harvest types) will contribute toward maintenance of habitat characteristics for marten.

River Otter

The river otter's primary habitat are in old-growth stands located near the coast and larger lakes and streams of the Project Area. The otter is an MIS that benefits from the restriction of timber harvest within the Beach Fringe and Estuary, Semi-Primitive Recreation, Stream and Lake Protection, Rio Roberts RNA, and Scenic and Recreation River LUD's. No units were identified as being within high quality river otter habitat (Table 4-37); therefore, all action alternatives maintain current habitat capability (Table 4-36).

Bald Eagle

The potential effect of the Control Lake Project on bald eagles would be limited to disturbance to nesting eagles from proposed logging operations. The extent of these impacts would vary depending on: (1) the amount of timber harvest activity occurring in the vicinity of eagle habitat under each alternative; (2) type of logging operation; (3) amount of screening cover within the vicinity of nest sites; and (4) timing of logging operations relative to eagle nesting.

Scheduling development activities away from beach fringe, estuaries, lake buffers, and Class I and II streams would effectively avoid impacts to bald eagle habitat (Table 4-36). Management activities within 330 feet of an eagle nest site are restricted by an Interagency Agreement between the Forest Service and the USFWS (USDA Forest Service and USDI Fish and Wildlife Service, 1990). Additionally, timing restrictions have been established for controlled blasting and helicopter logging that may occur within one-half mile of an eagle nest site (Table 4-38).

Twelve bald eagle nest buffers are located within one-half mile of 11 harvest units. Three nests located adjacent to proposed harvest units were flagged and distance to unit boundary measured to ensure maintenance of buffer zones. This included modifying the boundary of unit 593-408 to exclude the 330-foot buffer around an eagle nest that was originally located within the unit.

Vancouver Canada Goose

The high quality nesting and brood-rearing habitat of Vancouver Canada geese is generally in forested areas near wetlands, lakes, streams, beaches, and estuaries. Implementation of the action alternatives would result in a 1 to 3 percent decrease from current conditions (Table 4-36). Alternative 12 would include harvest of one unit located within high quality goose habitat (Table 4-37). Alternatives 10 and 11 do not propose harvest of high quality goose habitat. Road density within the Project Area would increase with implementation of any of the action alternatives. Vancouver Canada geese reportedly avoid habitat located within 660 feet of an open road. Planned road closure of between 11 (Alternative 10) and 62 (Alternative 12) miles of newly constructed roads (depending on the alternative) after completion of the harvest activities will reduce the effects on Vancouver Canada geese.

Table 4-38
Road Construction Affected by Seasonal Blasting Restrictions

Road Number	Associated Unit(s)
71-79-34.2	593-408
72-79-34.3C	593-424
72-79-34F	593-408
71-83-29.3	597.1-406

Red-breasted Sapsucker

The red-breasted sapsucker is a primary cavity-excavator, preferring low-volume, old-growth forest, although they can effectively use high volume forests. It is estimated that timber harvest conducted under the action alternatives would result in a decrease in habitat capability of 1 to 8 percent, respectively, over current conditions (Table 4-36).

Under the action alternatives, between 32 units (Alternative 10) and 113 units (Alternative 12) located on high quality sapsucker habitat would be harvested. Model results indicate that the Honker Block currently exhibits the largest concentration of high quality sapsucker habitat within the Project Area (see *Affected Environment* section).

Harvest of several units within the south portion of the Western Shoreline Late-successional Corridor would result in fragmentation of existing high quality habitat; however, the remainder of this corridor would remain relatively unaffected.

The effects of reduced snag and defective tree habitat on red-breasted sapsuckers over the long term are expected to be reduced through unit design which would maintain structure in every harvest unit. For units receiving Type A through F harvest, the presence of large snags and defective trees within these second-growth stands may increase sapsucker use of these areas. Harvest Type G and H would retain sufficient structure to provide limited habitat throughout the timber rotation, and Type I is anticipated to retain sufficient structure for continued use within these units.

Hairy Woodpecker

The hairy woodpecker is a primary excavator that prefers high-volume old-growth forest, but can also effectively use lower volume stands. The action alternatives would decrease Project Area habitat capability by 1 to 9 percent (Table 4-36) over current conditions. Between 7 harvest units (Alternative 10) and 36 harvest units (Alternative 12) are proposed within high quality hairy woodpecker habitat (Table 4-37). The Western Peninsula is comprised of small, isolated patches of high quality habitat. Implementation of any of the action alternatives would not affect the large, linear high quality patch located in the Big Salt Block. In addition, the largest high quality patches in the northern portion of the West Shore Corridor would remain intact. Harvest units proposed in the eastern portion of the Project Area would mainly affect high quality habitat by removing timber from patch perimeters. A large, linear patch located within the Thorne River-Hatchery Creek Scenic River LUD would remain relatively intact as well as the concentration of high quality habitat located in the southeast portion of the Honker Block. The remainder of proposed units affecting hairy woodpecker habitat would reduce the size of small patches scattered throughout the Project Area.

The effects of reduced snag and defective tree habitat on hairy woodpeckers over the long term would be reduced through unit design which maintains structure in every harvest unit. The effects of retention within the eight proposed harvest types would be similar to those described for red-breasted sapsucker.

Brown Creeper

The brown creeper is highly dependent on large-diameter, old-growth trees (Volume Class 6 and above). Timber harvested under the action alternatives would result in a 1 to 6 percent decrease, respectively, in habitat capability over current conditions. Depending on the alternative, between 1 unit (Alternative 10) and 9 units (Alternative 12) containing high quality habitat would be harvested (Table 4-37). Specifically, a large high quality habitat patch, partially located within the eastern portion of Big Salt Block, and extending southwest outside of the Big Salt Block, would be reduced by units 595-403, 405, 406, and 412. In addition, units 595-419, 423, and 424 would fragment a large linear patch of high quality habitat within the Rio Roberts Corridor.

High quality brown creeper habitat within the Elevenmile Block, would not be affected by the action alternatives. A large patch of contiguous, high quality habitat located entirely within the Big Salt Block, and the large patches located within and adjacent to the Thorne River Scenic River LUD would remain unaffected by the implementation of the action alternatives.

The remainder of the proposed units affecting brown creeper habitat would reduce the size of patches scattered throughout the Project Area. Distance between patches would increase, especially in areas that have already received intensive harvest activities.

The effects of reduced snag and defective tree habitat on brown creepers over the long term would be reduced through unit design which would maintain structure in every harvest unit. The effects of retention within the eight proposed harvest types would be similar to those described for red-breasted sapsucker.

Effects on Snag Density by VCU

Snags and defective live trees provide critical nesting and foraging habitat for cavity excavators. Therefore, the Proposed Revised Forest Plan (TLMP, 1991a) Standards and Guidelines call for maintenance of a minimum of 275 snags per 100 acres of forested habitat, averaged on a fourth-order watershed basis, to provide for cavity excavating wildlife species. VCU's are assumed to approximate fourth-order watersheds. To ensure that this standard and guideline was met, three levels of concern were developed. A Concern Level was assigned to each individual harvest

unit, based on site-specific review and results of the snag density analysis. During field analysis, wildlife biologists assessed each unit to identify any site-specific retention areas.

Concern Level 1 was assigned for units located in VCU's where snag densities exceeded Standards and Guidelines and were not adjacent to past harvest units. Concern Level 2 was identified for units located in VCU's that are at or near the minimum snag densities prescribed by the Proposed Revised Draft Forest Plan or are adjacent to past harvest units. For units located in VCU's currently below the minimum snag densities prescribed by the Proposed Revised Draft Forest Plan or were located within a heavily harvested subdrainage, Concern Level 3 was assigned. The Concern Level and specific design for each proposed unit within the Project Area is included in the unit card and silvicultural prescription.

Nine general types of silvicultural treatments were applied through the ID Team process. These silvicultural treatments address the levels of concern discussed above by retaining differing levels of structure within each unit. The treatments were developed in coordination with foresters, logging engineers, wildlife biologists, and visual resource specialists. These treatments are used in place of, or in conjunction with, the general retention levels. The typical design for each level of retention is described in the *Silviculture, Timber, and Vegetation* section.

For units identified as Concern Level 1, a Type A, or above, harvest prescription was designated. Units identified as Concern Level 2, were assigned, at a minimum, as harvest Type B, and for Concern Level 3, an overstory removal, shelterwood/seedtree harvest, or an uneven-aged harvest was prescribed. Type C regeneration harvest was developed for helicopter harvest units, and typically replaces a Type A regeneration harvest.

The *Silviculture, Timber and Vegetation* section of Chapter 3 displays the designated regeneration harvest types that would be implemented within the proposed harvest units. The type of harvest, the percent of volume that would typically be maintained under each silvicultural treatment, and the percent of the acres proposed for harvest under each silvicultural treatment, are also presented.

Use of the silvicultural treatments as prescribed would reduce the effects of timber harvest on wildlife, particularly species such as cavity excavators that utilize stand attributes characteristic of old-growth forest. By retaining structure within harvest units, within-stand diversity levels could be better maintained within regenerating units. Leaving live trees, as well as snags, ensures adequate snag recruitment throughout the length of the rotation, provides additional snow interception within regenerating units, and maintains greater structural diversity within the second-growth stands. Leaving nonmerchantable trees and safe snags within the harvest unit is a minimum recommendation identified for all harvest units. Harvest Types A through F would provide snags over the harvest rotation and provide an increased level of structure over traditional regeneration harvests. Types G and H would retain sufficient structure to provide limited habitat for cavity excavators throughout the timber rotation. Harvest Type I is anticipated to retain sufficient structure for continued use of these units by cavity excavators.

Densities within old-growth stands currently range from 14.4 to 21.3 snags per acre (snags greater than or equal to 15 inch dbh and greater than or equal to 10 feet in height). Although snags and green trees would be retained within harvest units, snag densities within all VCU's would decline with implementation of any of the action alternatives due to the reduction in available live trees needed for future recruitment. The retention of snags and all age classes of live trees, however, is expected to maintain snag densities at or above the minimum 275 snags per 100 acres throughout the rotation.

These measures have been designed to increase structural diversity while minimizing timber volume losses within harvest units. Increasing the total area harvested to compensate for structure retention could increase overall fragmentation in the Project Area and further reduce landscape diversity levels. No additional acres will be harvested to compensate for structure retention.

The TLMP Revision (1997) proposes new Standards and Guidelines for the maintenance of marten habitat which will further contribute to the availability of snags and downed woody material for use by cavity-dependent species.

Wildlife Population Objectives

The existing habitat capabilities (1995) within WAA's 1318 and 1323 are above the minimum required to sustain the average documented historical deer harvest. As stated in *Affected Environment* section, WAA's 1319 and 1421 are currently below the proposed population objectives. Habitat capabilities in all WAA's would be reduced with harvest of an action alternative. WAA's 1319 and 1421 would fall further below the population objective, but WAA's 1318 and 1323 would continue to exceed the objective under all alternatives. For a complete discussion of subsistence resources, refer to the *Subsistence* section.

Cumulative Effects

Cumulative effects are the result of accumulated land management activities. Assessed individually, the disturbances caused by a particular action may appear to have only a minor effect, but if a multitude of actions are assessed collectively through time, their cumulative effects may result in a greater ecological disturbance.

The assessment of cumulative effects in the Control Lake Project Area and adjacent areas is based on past timber harvest and related activities, and other foreseeable actions through the year 2054 (which is the end of the first 100-year rotation). This cumulative effects analysis also focuses on effects to the year 2004, which is halfway through the current rotation. For this analysis, Alternative 12, the unit pool under the TLMP Revision (1997) is used as the 2004 harvest condition. It is assumed that all commercially suitable old growth under the TLMP Revision (1997) would be harvested by year 2054; this area would not reestablish all of the characteristics currently defining old-growth habitat. The most apparent effect of timber harvest activities over the long-term would be the direct loss of wildlife habitat.

As forested stands are harvested, regenerated communities would exhibit different habitat characteristics, resulting in the displacement of localized wildlife communities. As stands of old growth are harvested, and old-growth fragmentation continues to increase, wildlife competition would also increase. This rivalry for resources would result in the local displacement of less competitive species.

TLMP (1997) Standards and Guidelines for landscape connectivity would provide corridors of old-growth forest among large and medium old-growth habitat reserves and other natural setting LUD's at the landscape scale (USDA Forest Service, 1997). Consequently, opportunities for wildlife species to disperse would be maintained and segregation of genetic pools would be minimized (USDA Forest Service, 1997). This connectivity of gene pools would maintain the genetic variability of a species and increase the likelihood of the survival of localized populations.

Under both the Control Lake Project and adjacent Central Prince of Wales and Polk Inlet Projects, structure in the form of dead and downed woody material, snags, and green tree replacements would be retained within proposed units. The objective of retaining structure is to maintain some of the old-growth characteristics normally lost through timber harvest. Since structure retention is expected to continue with future harvest entries, the cumulative effects of timber harvest on old-growth dependent wildlife species would be partially mitigated. The effectiveness of retaining structure during harvest is expected to be most evident towards the end of a stand's rotation cycle. The *Silviculture, Timber,* and *Vegetation* section describes and illustrates this management approach in detail.

The TLMP Revision (1997) proposes new Standards and Guidelines for the maintenance of marten habitat which will further contribute to the availability of forest stand structure, including snags and downed woody material, for use by cavity-dependent species.

The anticipated continuation of road construction within the Control Lake Project Area and adjacent Central Prince of Wales and Polk Inlet areas would likely increase subsistence and non-subsistence hunting pressure in these areas. This effect can be controlled by adhering to the current management practice of closing dead-end local roads or roads accessing wildlife habitat management areas upon completion of future harvest entries.

The task of maintaining habitats to support viable populations has been approached through several evolving strategies. The *Biodiversity* section describes the strategy being implemented under the new Forest Plan. The TLMP Revision (1997) addresses the issues of biodiversity and viable populations on the Forest-wide level. The new Forest Plan strategies have been incorporated into the Control Lake alternatives.

The cumulative percent change in habitat capability presented in Table 4-39 for 2004 is based on the habitat capability models described in USDA Forest Service (1991a) and assumes that all units in Alternative 12 have been harvested. For 2054, habitat capability was estimated by

assuming all suitable and available old growth would be harvested and reducing habitat capability for each species between 2004 and 2054 in proportion to the reductions in habitat capability units per acre of old growth harvested that were estimated using the habitat capability models for 1954 to 2004.

Table 4-39
Cumulative Changes in MIS Habitat Capability through 2054

Species	% of 1954 Habitat Capability		
	1997	2004	2054
Black-tailed Deer[1/]	91%	88%	70%
Black Bear[2/]	82%	77%	57%
Wolf[1/]	91%	88%	69%
Marten[1/]	89%	88%	70%
River Otter	93%	93%	93%
Bald Eagle	96%	96%	96%
Goose	93%	91%	81%
Red-breasted Sapsucker[1/]	93%	88%	65%
Hairy Woodpecker[1/]	73%	68%	44%
Brown Creeper[1/]	58%	56%	44%

1/ Includes patch-size effectiveness reduction factor (see *Biodiversity* section).

2/ Includes disturbance reduction factor to account for disturbance to black bears associated with roads.

The cumulative effects on wildlife of implementation of the new Forest Plan have recently been extensively analyzed (USDA Forest Service, 1997). These analyses and their conclusions are incorporated here by reference.

Mitigation

Wildlife mitigation measures were developed for the Project Area based on: (1) application of forest-wide Standards and Guidelines; (2) results of studies on wildlife enhancement projects on Prince of Wales Island (DellaSala et al., 1993); (3) results of field visits by Project team biologists; and (4) ongoing observations in the Project Area. The Project team was able to locate specific areas where mitigation measures would be most effective; these areas should be

emphasized during sale layout. The following measures were designed to eliminate or affect timing of harvest in valuable habitats (Landscape Level Mitigation); to increase structural diversity for wildlife within harvest units (Stand Level Mitigation); and to protect wildlife from direct and indirect effects of road construction, harvest operations or human access (Protection Measures). Site-specific mitigation measures are identified by harvest unit (Appendix C) and on the unit cards (Appendix F in Draft EIS).

Landscape Level Mitigation

Forest management goals for wildlife direct that as much contiguous old-growth habitat as possible be maintained to ensure the maintenance of viable populations. Additionally, adverse impacts from human activities should be minimized through road and facility management. Under the guidelines of this directive, specific geographic areas were deferred from timber harvest under some alternatives. These areas were selected for various combinations of reasons, all of which provide benefits to MIS and the complex of old-growth obligate and associate species they represent. Chapter 2 has a detailed description of alternatives and landscape zones.

The TLMP Revision (1997) incorporates new land use designations for the protection of old growth forest. These old-growth reserves, and their connecting corridors, will provide long-term maintenance of large old-growth blocks on the landscape level. In addition, new Standards and Guidelines for protection of wildlife species have been adopted. These will be incorporated into the Control Lake Timber Sale, as specified in the ROD for the TLMP Revision (1997).

Stand Level Mitigation

Stand diversity levels within harvest units could be enhanced through the application of specific silvicultural measures designed to provide structural diversity within regenerating stands. Measures include clearcutting with reserve trees (using one of the four types of clearcuts defined in the *Silviculture* section) or partial cutting. The primary objective of this mitigation strategy would be to provide habitat for species that use specific stand attributes characteristic of old-growth forest (e.g., large-diameter snags and structural diversity).

By including old-growth "islands" or reserve trees within harvest units and by partial cutting, within-stand diversity could be better maintained within regenerating units. Old-growth islands should reserve large-diameter snags and live trees. Where possible, the size and density of reserve trees should be dictated by Standards and Guidelines for cavity-nesting species. For instance, to maintain 50 percent of the maximum populations of hairy woodpeckers in an area, approximately 336 soft and hard snags that are greater than or equal to 15 inches dbh and greater than or equal to 10 feet in height would need to be maintained per 100 acres. Snags could be distributed in clumps away from guylines and in protected draws to minimize blow-down effects and conflicts with safety standards (USDA Forest Service, 1993). Retaining live trees, as well as snags, ensures adequate snag recruitment throughout the length of the rotation, provides additional snow interception within regenerating units, provides greater structural diversity within the second-growth stand, and provides refugia for important understory species which can recolonize the second-growth stand when it is old enough. To ensure that nesting habitat, structural diversity, and plant refugia are well-distributed in the second-growth stand, no location in a harvest unit should be more than 400 feet from old-growth trees, wherever possible. Leaving nonmerchantable trees and safe snags along the edges or throughout the harvest unit is a minimum recommendation identified for all harvest units as a means of maintaining snag densities and increasing structure in second-growth stands.

Mitigation Measures W1 through W5 (described in Chapter 2) incorporate methods to achieve stand level structural diversity. Approximately 275 snags per 100 acres will also be maintained in each VCU. Where possible this level will also be maintained within individual harvest units.

This will help maintain local wildlife and plant populations that are dependent upon this component of wildlife habitat. Such species include cavity-nesters, insects, fungi, and small mammals and their predators (see *Effects on Wildlife* section, Chapter 4). In addition, green-tree replacements and down woody material will be retained. The level of retention for each unit was determined with input by a wildlife biologist. Refer to the Project Unit Cards for more specific details. The exact location of snag and green-tree replacement zones within each harvest unit will be designated during layout or sale administration, and will be designed in such a fashion as to not impose undue safety hazards and to be compatible with the logging system.

All VCU's proposed for harvest in the Control Lake Sale meet the TLMP Revision (1997) Standards and Guidelines for protection of marten habitat, with the exception of VCU 597.2. These Standards and Guidelines will be implemented in VCU 597.2 in a manner that is least disruptive to the design and implementation of the project. The extent to which these Standards and Guidelines would be incorporated into the sale would be determined through review by an interagency implementation team consisting of the USFWS, NMFS, Environmental Protection Agency, and pertinent state agencies.

In Southeast Alaska, precommercial thinning is the preferred silvicultural treatment in regenerated stands and also has been widely used to enhance young-growth habitat for wildlife (see *Silviculture* section). Since this technique results in uniform tree growth, it may not achieve the desired effect of enhancing diversity levels within regenerating stands. Consequently, the specific benefits to wildlife are the subject of recent debate and studies are currently underway to assess the effectiveness of this enhancement program (DellaSala et al., 1992). The proposed harvest types provide an opportunity to determine the effectiveness of different methods for maintaining structural diversity within regenerating units and their use by wildlife. Such techniques would require follow-up monitoring to determine their effectiveness and the need for further design modifications. Mitigation measure W6 (variable tree spacing commercial thinning; Chapter 3) is recommended on an experimental basis.

All of the above measures would be used as wildlife mitigation in the Control Lake Project Area. Although the above recommendations likely would increase stand-level diversity in regenerating forests, they are not intended to compensate for landscape diversity losses. Furthermore, small old-growth islands may only produce a positive mitigative effect when the total area harvested is not significantly increased to account for reductions in volume associated with structure retention. Increasing the total area harvested to compensate for old-growth islands could increase overall fragmentation in the Project Area and further reduce landscape diversity levels. The measures discussed above have been designed to increase structural diversity while minimizing timber volume losses within harvest units.

Protection Measures

The following additional mitigation measures (W7-W10; Chapter 2) are proposed to provide protection for wildlife from human disturbance both during and after harvest operations:

1. If a marbled murrelet nest is identified within the Project Area, a minimum 30-acre nest area surrounding the nest tree will be designated as no-harvest (Mitigation Measure W7).

2. If a bald eagle nest is identified within the Project Area, a 330-foot forested radius will be maintained surrounding the nest tree. Between March 1 and August 31, restrictions on controlled blasting would be implemented on all road construction proposed within a one-half mile radius of a bald eagle nest site and on all helicopter logging and/or flight paths within one-quarter mile of a nest. These restrictions would be lifted after June 1 if the nest is found to be unoccupied. All management activities will be consistent with the Interagency

Bald Eagle Management Agreement unless a variance is granted from the USFWS (Mitigation Measure W8).

3. Existing and proposed roads would be managed to discourage or prohibit motorized use following harvest activities to minimize human disturbance to wildlife (i.e. reduce road densities) and to limit entry into valuable wildlife areas. A list of road systems on which post-harvest use would be discouraged or prohibited for wildlife protection is presented in Appendix E of the Draft EIS. For a more detailed presentation of access management, see the *Transportation and Facilities* section (Mitigation Measure W10).

4. Restrict harvest and road construction during wolf mating, denning, and rearing periods within one-half mile of dens (Mitigation Measure W12).

The Forest Service will inform the purchaser, contractor, and other persons in the area that peregrine falcons, bald eagles, or goshawks could be potentially present, and that they are protected by law. The Forest Service would also inform the purchaser, contractor, and other persons in the area about the proper procedures for reporting suspected sightings or sign of threatened, endangered or sensitive species.

Monitoring

A variety of Forest-wide monitoring activities are proposed in the TLMP Revision (1997) to verify that Standards and Guidelines affecting wildlife have been implemented and are effective. The Ketchikan Area prepares an annual monitoring report addressing the status of Forest Plan monitoring (see Chapter 2).

Project-specific monitoring has been identified to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees and five types of partial cuts prescribed for Control Lake Project units as an ecosystem management measure. This monitoring should include the preparation of a brief report by wildlife and visual resource specialists, based on ground observations and comparisons with units cards and silvicultural prescriptions for approximately 20 percent of the units (see Chapter 2).

This page left intentionally blank.

Threatened, Endangered, and Sensitive Species

Key Terms

Category 3 Candidate—species that are now considered to be more abundant and/or widespread than previously thought.

Category 2 Candidate—a species or group of species being considered by the U.S. Fish and Wildlife Service for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat.

Endangered—a species in danger of extinction throughout all or a significant portion of its range.

Haul-out—area of large, smooth, exposed rocks used by seals and sea lions for resting and pupping.

Patch—an assemblage of similar vegetation - in this document the focus is on old-growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.

Sensitive—species (identified by the Regional Forester) whose population viability is of concern on National Forests within the region, and which may need special management to prevent their being placed on State and Federal threatened and endangered species lists.

Threatened—a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

This analysis of the environmental consequences of the action alternatives on threatened, endangered, and sensitive species considers the direct, indirect, and cumulative effects of timber harvest in the Project Area. Direct and indirect effects are projected to 1998, the anticipated end of implementation of the Control Lake Project; to 2004, which includes the reasonably foreseeable future; and to 2054, to show the cumulative impacts of harvesting all the suitable/available CFL through the first rotation and to show the cumulative impacts of past and proposed timber harvest.

Plants

Glyceria leptostachya is the only federal candidate or Region 10 sensitive species known to occur in the Project Area. Because its typical habitats are swamps and stream and lake margins (and the one observation near Control Lake was along a stream) timber harvest and road construction activities will generally avoid preferred habitats. The documented occurrence of the species is not located within a proposed harvest unit.

No other Federal candidate species or Region 10 sensitive species are known to occur in the Project Area, and none were found during field surveys. Of those with potential to occur (see Table 3-31 in Chapter 3), all occupy habitats that are: wet, boggy, or open meadow areas; rocky slopes or cliff areas; or stream and lake margins. In general, most timber harvest and road construction activities will avoid these areas. Very wet areas and cliffs were generally excluded from harvest units and no-cut buffers were prescribed along all moderate to large streams and lakes, as well as many small ones. Therefore, although undetected individuals could be affected, no significant effects are expected for any of the species.

Wildlife

Humpback Whale

Because the humpback whale is primarily affected by changes in the marine environment, the primary effects from timber management operations in the Project Area would be limited to disturbance of whales by human activities at LTF's and their associated camps, the movement

of log rafts from LTF's to mills, and associated boating and aircraft activities including log raft towing and recreational boating by timber workers (USDA Forest Service, 1991). In addition, humpback whales may become entangled in LTF cables. The one known incidence of whale entanglement in LTF cables occurred in the Tongass National Forest (USDA Forest Service, 1991a).

Timber harvest operations in the Project Area under each of the timber management alternatives are not expected to adversely affect whales that potentially migrate through the Control Lake area.

Steller Sea Lion

The Steller sea lion is primarily associated with the marine environment; therefore, potential impacts from timber management operations in the Project Area are limited to the LTF's and their associated camps, and log shipments from LTF's to their destination. Mitigation measures should reduce disturbance associated with logging operations in the Project Area to acceptable levels under each of the timber management alternatives. Consequently, no alternative is likely to adversely affect sea lions.

Steller sea lion

Alexander Archipelago Wolf

Project effects on the wolf are addressed in the *Wildlife* section.

American, Arctic, and Peale's Peregrine Falcon

The primary effect of the action alternatives on peregrine falcons potentially migrating through the Project Area include localized disturbances of prey species near shoreline areas, particularly waterfowl and shorebirds. Forest-wide Standards and Guidelines protect seabird rookeries and waterfowl concentration areas that occur on the Tongass National Forest (USDA Forest Service,

1991a). In addition, the application of 1,000-foot buffers along the beach fringe and around estuaries should minimize the effect on prey species that occupy shoreline areas under each of the timber management alternatives. Project effects on the peregrine falcon nest in the Project Area can be mitigated by timing restrictions on harvest and road-building activities (see Chapter 2). Consequently, none of the timber management alternatives is likely to affect peregrine falcons should they migrate through the area.

Osprey

The Control Lake Project is not expected to affect nesting osprey as no known nest sites occur in the Project Area and availability of nesting and foraging areas does not appear to be a factor limiting population growth. In addition, minimal or no effects on preferred osprey habitat are expected from project activities as uncut buffers will be maintained near streams, lakes, and coastal areas. If nests are discovered in the Project Area, Standards and Guidelines outlined in the Forest Plan will be followed.

Eskimo Curlew

None of the timber management alternatives is likely to affect Eskimo curlews because: (1) this species has not been sighted in Alaska since 1986; (2) the Project Area is outside the normal migratory path of the Eskimo curlew; and (3) coastal areas that are most likely to be used by migratory curlews are protected by 1,000-foot buffers, as specified in the forest-wide Standards and Guidelines.

Trumpeter Swan

No direct disturbance to trumpeter swans is expected from the Control Lake Project because most activities will occur during non-winter periods when the swans are absent from the Project Area. Further, the project will not affect ice-free shoreline areas that serve as preferred winter habitats. These areas are protected by riparian, estuarine, and beach fringe buffers.

Aleutian Canada Goose

None of the timber management alternatives are likely to affect the Aleutian Canada goose because: (1) with the exception of an occasional migrant that wanders off its traditional migration route, it is unlikely that this species occurs in the Project Area (personal communication, J. Lindell, Endangered Species Coordinator, USFWS, Anchorage, September 18, 1992); and (2) coastal areas most likely to support migrating geese and are protected by 1,000-foot no-cut buffers.

Marbled Murrelet

Based on survey results, the marbled murrelet appears to nest in relatively high numbers in old-growth stands of the Project Area. Therefore, timber harvest will reduce available nesting habitat. Loss of old growth associated with the action alternatives would range from approximately 1,124 acres or 1 percent of the existing old growth for Alternative 10, to 3,956 acres or 5 percent for Alternative 12. These reductions are expected to produce similar to slightly higher reductions in marbled murrelet habitat capability. The slightly higher reductions are related to the increased fragmentation of old-growth habitats that would occur under the action alternatives.

A measure of the effect of fragmentation on murrelet habitat can be obtained by calculating a patch size effectiveness (PSE) index for the Project Area based on a PSE curve developed specifically for the marbled murrelet at an interagency workshop to recommend patch size

relationships and corridor requirements (held at Juneau, Alaska, July 31 to August 1, 1989). This curve assigns an effectiveness index value of 0 to old-growth patch sizes less than 70 acres in size and a value of 1.0 to patches greater than 600 acres in size. Intermediate values at curve inflection points include: 0.1 for patches of 100 acres, 0.5 for patches of 250 acres, and 0.9 for patches of 500 acres. Based on this curve and the frequency of patch sizes in the Project Area, average PSE values were calculated for each of four regions of the Project Area (Table 4-40).

Table 4-40

Acres of Old Growth Remaining and Average Patch Size Effectiveness Indexes for the Marbled Murrelet by Alternative and Area

	Western Peninsula		Kogish Mountain		South of 30 Road		North of 30 Road		Total	
	Acres	PSE	Acres	PSE	Acres	PSE	Acres	PSE	Acres	PSE
1954	11,950	0.854	5,455	0.929	26,427	0.923	42,381	0.931	86,213	0.918
1997	11,129	0.841	5,128	0.925	21,080	0.844	38,824	0.912	76,161	0.884
2000										
Alt. 10	11,129	0.841	4,976	0.920	20,123	0.847	38,815	0.912	75,043	0.885
Alt. 11	10,887	0.840	4,488	0.774	19,377	0.818	38,214	0.907	72,966	0.865
Alt. 12	10,623	0.836	4,4488	0.774	19,224	0.821	37,869	0.907	72,204	0.865

Overall reductions in PSE from 1997 conditions for the marbled murrelet would range from none for Alternative 10, to 2 percent for Alternative 12. Multiplying the PSE by the corresponding acres gives an adjusted acreage, which can be used as an index of habitat capability for the marbled murrelet. Thus, for 1997 the adjusted habitat acres would be 67,326. The adjusted habitat acres would range from 66,413 under Alternative 10 to 62,456 under Alternative 12. This represents a reduction in habitat capability ranging from 1.4 to 7.2 percent, respectively.

Kittlitz's Murrelet

The Project Area is beyond the known southern distribution limits of the Kittlitz's murrelet. Thus, it is very unlikely that Kittlitz's murrelets would occur in the Project Area (personal communication, Nancy Naslund, Wildlife Biologist, USFWS, Anchorage, December 16, 1994). Even if this species were to occur in the Project Area, it is not known to nest in forested habitat affected by the Project, preferring barren ground above the timberline. Thus, there are no effects anticipated to Kittlitz's murrelet from Control Lake timber harvest activities.

Queen Charlotte Goshawk

None of the alternatives propose timber harvest of known nest areas. Limited harvest is proposed within the goshawk post-fledgling area (PFA) in Logjam Creek under Alternatives 11 and 12. These alternatives include 118 acres of harvest within the PFA. No harvest within the PFA is proposed under Alternative 10.

As discussed in Chapter 3 (*Threatened, Endangered, and Sensitive Species* section), a new goshawk nest was recently discovered in the Rio Roberts drainage, south of the 30 Road (Forest Road #9). A PFA will be designated for this pair following collection of sufficient home range information. The nest site is about 0.5 mile from the nearest harvest unit and portions of four additional harvest units occur within 1 mile of the nest site (596-413, 596-415, 596-416, 596-417, and 576-423). Alternatives 11 and 12 include two of these units and Alternative 10 includes none of them.

Any pairs of goshawks not discovered prior to timber harvest may be affected if the harvest unit corresponds to key stands of habitat. Studies of goshawk nest sites in Idaho indicated that timber harvesting within 0.25 mile (0.4 km) of nest sites resulted in a 75 to 80 percent reduction in occupancy of the nesting territories (Patla, 1990). Any goshawk nest found prior to harvest will be protected using the goshawk management guidelines in effect at that time.

Project effects on potential goshawk habitat are represented by the loss of old growth, especially volume classes 5 through 7, and the degree of fragmentation that would occur, particularly for large old-growth patches. Loss of old growth due to the action alternatives would range from approximately 1,124 acres or 1.5 percent of the existing old growth under Alternative 10, to 3,956 acres or 5.2 percent for Alternative 12 (Table 4-41). Harvest of volume classes 5 through 7 would be highest under Alternative 12 and lowest under Alternative 10. Correspondingly, the area of old growth remaining in large patches would be lowest under Alternative 12; the reduction would be 10 percent for patches greater than 1,000 acres, and 4 percent for patches greater than 5,000 acres relative to existing conditions. Alternative 10 would produce the lowest reduction in areas of the action alternatives; a 4 percent reduction would result for patches greater than 1,000 acres, and a 1 percent reduction would result for patches greater than 5,000 acres.

Table 4-41

Comparison of the Effects of the Alternatives on Goshawk Habitat (in Acres)

Alternative	Total Harvest	Harvest of VC4-7	Harvest of VC5-7	Areas Remaining in OG Patches >1,000 acres	Area Remaining in OG Patches >5,000 acres
1	0	0	0	61,122	36,337
10	1,281	1,124	623	58,553	36,144
11	3,612	3,199	1,925	55,692	35,290
12	4,452	3,956	2,346	55,139	35,004

Harlequin Duck

Riparian habitats along all rivers and streams on the Forest will be managed according to the Riparian management prescriptions or a more restrictive management prescription (such as when a stream or river is in a Wilderness Area). Nesting habitat requirements are expected to be maintained. Since winter habitat occurs in the marine environment in areas of high surf and rocky beaches, no effect on harlequin ducks is anticipated with any alternatives of the Control Lake Project.

Olive-sided Flycatcher

Riparian habitats along all lakes, rivers, and streams on the Forest will be managed according to the Riparian management prescriptions or a more restrictive prescription (such as when a stream or river is in a Wilderness Area). Upland habitat value for the olive-sided flycatcher may improve due to logging, particularly with the type of harvest proposed for the Control Lake Project. Created openings will produce greater edge, and the partial cutting and clearcut types prescribed for the Control Lake Project all incorporate varying degrees of reserve trees and snags, which should improve flycatcher habitat. Therefore, the Project may affect olive-sided flycatcher habitat, though the effect is likely to be positive.

Spotted Frog

The distribution of the spotted frog in the Project Area could not be determined from the general walk-through of proposed harvest units and roads. However, based on habitat requirements, spotted frogs are primarily limited to permanent bodies of water (Hodge, 1976; Broderson, 1982; Nussbaum et al., 1983). Forest-wide Standards and Guidelines maintain buffers along shorelines and around all Class I and II streams, many Class III streams, and a 1,000-foot buffer around estuaries. Therefore, impacts to frogs potentially breeding within riparian areas should be minimized under each of the timber management alternatives. However, some incidental impacts would occur to forested muskegs and small ponds within harvest units (generally less than 0.1 acre).

Franklin's Grouse

Timber harvest is likely to negatively affect Franklin's grouse habitat. Habitat impacts are likely to be on the same order or less than the impacts on the MIS birds. Assuming that habitat capability for Franklin's grouse parallels the habitat capabilities for the red-breasted sapsucker, the action alternatives would produce reductions of 1 to 5 percent from existing conditions. However, as noted in Chapter 3, the species is considered to be fairly common in the Project Area.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes and the effects of multiple management actions. Wildlife habitat and associated populations of threatened, endangered, and sensitive species may be influenced by the result of multiple entries to remove timber within the Project Area, and the combined or synergistic effects of habitat loss in adjacent areas. The humpback whale, Steller sea lion, peregrine falcon, osprey, Eskimo curlew, trumpeter swan, Aleutian Canada goose, Kittlitz's murrelet, harlequin duck, olive-sided flycatcher, and spotted frog are unlikely to experience long-term cumulative effects because of their limited use of the area or because their habitats are unaffected or minimally affected by timber harvest. The populations of Queen Charlotte goshawk and marbled murrelet may experience long-term declines under the revised Forest Plan (1997). However, the revised Forest Plan is expected to provide a sufficient amount and distribution of habitat to maintain viable and well distributed populations across the Tongass after 100 years (USDA Forest Service, 1997).

The new Forest Plan (1997) includes an old-growth habitat strategy that is intended to maintain well-distributed viable populations across the Tongass. It is designed to reduce fragmentation of old-growth habitat and has been developed through careful analysis and integration of the best scientific information available on the subject (see Appendix N of the Final EIS, USDA Forest Service, 1997). The old-growth habitat conservation strategy incorporated into the new Forest Plan, consists of two basic components: (1) a forest-wide reserve network and (2) a matrix management strategy. This overall strategy is described in the *Biodiversity, Cumulative Effects* section of this chapter.

Mitigation

Mitigation for threatened, endangered, and sensitive species results primarily from avoidance of known special use sites such as nest sites for birds and haulout areas for sea lions. Several special use sites were identified during field investigations and literature reviews for the Control Lake Project. Mitigation measures, including buffer zones, have been designed to avoid these sites during project activities. The final unit layout and road location that would occur before harvest would provide one more level of observation and opportunity for avoidance. Goshawk nests were identified in the Logjam Creek and Rio Robert Creek areas. A PFA surrounding the Logjam nest site was designated and harvest activities will be limited within it. A PFA will be designated for the Rio Roberts site and harvest activities will be limited within it also. Region 10 goshawk management guidelines (see TLMP, 1997) will be implemented (Mitigation Measure W9).

A peregrine falcon nest had been identified on the Steelhead Creek drainage. Harvest and road construction activities will be restricted during the nesting season within one-half mile of active nests (Mitigation Measure W14).

Mitigation measures for humpback and other whales would include: (1) the avoidance of Forest Service aircraft flights below 500 feet above sea level in the known vicinity of whales when weather ceilings permit; (2) the avoidance of the intentional approach of a vessel of 100 feet or more in length within one-quarter mile of whales when safe passage exists; (3) and the avoidance of approach of a vessel of less than 100 feet in length to within 100 yards of whales when safe passage exists (Mitigation Measure W13).

A standard Forest Service timber sale contract clause will be included in all timber sale and road construction contracts to provide for protection of threatened, endangered, and sensitive species and their habitats. If a threatened or endangered species is sighted or its sign is found, the USFWS will be notified immediately.

Monitoring

Monitoring activities identified under the *Wildlife* section are also relevant to threatened, endangered, and sensitive species. Additional forest-wide monitoring for threatened, endangered, and sensitive species is conducted under the Forest Plan. The Ketchikan Area Monitoring Strategy, which was implemented in early 1994, specifically guides area monitoring efforts.

This page intentionally left blank.

Biodiversity

Key Terms

Between-stand diversity—reflects the amount of species turnover between habitat types or along environmental gradients (Sidle 1985).

Biodiversity—the variety of lifeforms in an area, including variation in structure, composition and function at scales from genetic to landscape.

Canopy—uppermost layer of foliage in the forest.

Edge—the natural or human created boundary between two distinct ecological systems, such as between forest and muskeg, or forest and a clearcut.

Edge effects—the biological and abiotic actions operating at edges; examples are differences in microclimate, species richness, productivity and predation.

Fragmented—reduced in size and connectivity—the degree of fragmentation is dependent upon scale (in space and time) and species specific life requisites.

Forage—to search for food.

Interior—that portion of a forested stand that is not influenced by edge effects.

Landscape-level diversity—a function of the spatial distribution of habitat types across a large area (Sidle 1985) such as a Project Area or ecological province.

Patch—an assemblage of similar vegetation—in this document the focus is on old-growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.

Patch Size Effectiveness— An index that measures how close the patches of habitat in an area represent the optimum size for a species.

Planning area—for the purpose of analyzing viable populations, the planning area is the ecological province, i.e., North Central and South Prince of Wales Ecological Province.

Snag—standing dead tree.

Stand-level diversity—the diversity within specific habitats or limited land areas as measured by number of species present (species richness) or structural complexity of a given habitat type (Sidle 1985).

Viable population—the number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations well distributed throughout their range in the Tongass National Forest.

Stand and Landscape Biodiversity

Each of the proposed action alternatives would result in changes in biodiversity at the stand, between-stand, and landscape levels. Stand-level diversity would decline temporarily as old growth is replaced by clearcuts, gradually increase during early stages, and decline again during the sapling stage as the canopy closes and understory vegetation is eliminated. The inclusion of snags and reserve trees as islands of old growth within regenerating stands and precommercial thinning to promote understory vegetation would at least partially offset some of the early seral declines in species richness. The benefits are limited because thinning has proven to be of short-term value (Alaback and Tappeiner, 1984) and snags and reserve trees would be subject to blowdown that could diminish their long-term effectiveness in providing structural attributes for old-growth-dependent species.

The action alternatives for the Control Lake Project have all been designed to incorporate a high degree of reserve tree and snag retention in clearcuts, and a high degree of partial cutting (see *Silviculture, Timber, and Vegetation* section in Chapter 4). Partial cutting is prescribed for 12 to 31 percent of the harvest-unit acreage in the action alternatives. Further, a total of 1 to 12 percent of all acreage is prescribed for uneven-aged management. Partial cutting is expected to maintain a substantial portion of the stand-level diversity associated with old growth.

Between-stand diversity is expected to increase under each of the action alternatives as a result of greater contrast between patch types created by clearcuts in juxtaposition with old growth. Increases in inter-patch contrast would result in greater edge area and more suitable habitat conditions for species associated with forest edges (e.g., crows, jays, ravens, great horned owl). This in turn could result in higher levels of edge-related predation and reductions in nesting productivity for species that are particularly vulnerable to nest-site predation (e.g., marbled murrelet, see *Threatened, Endangered, and Sensitive Species* section in Chapter 3) if interior patches are reduced to less than optimum. Edge-related factors would be lower with the types of harvest units proposed for the Control Lake Project. The extent of reserve tree retention and partial cutting should lessen the degree of contrast and the sharpness of the edge created. Between-stand diversity effects would be minimized for Alternatives 10 and 11, because of greater emphasis placed on retention of contiguous old-growth patches.

Diversity on a landscape level would change under each of the action alternatives due to a combination of habitat reduction, habitat fragmentation, and conversion of habitats to second growth. These declines would be offset somewhat by retention of riparian areas, beach fringe, estuary fringes, and old-growth patches. Landscape-level effects would be lowest under Alternative 10 and greatest under Alternative 12.

Habitat Diversity

As specified in forest-wide standards and guidelines, no additional harvest would occur in beach fringe or estuary and inland wetland buffer areas. (see *Wildlife* section for a more detailed description of effects on wildlife habitats.) The action alternatives would permit the harvest of 105 to 351 acres within riparian management areas. This represents 1 to 2 percent of the Riparian Management Areas, in the Project Area.

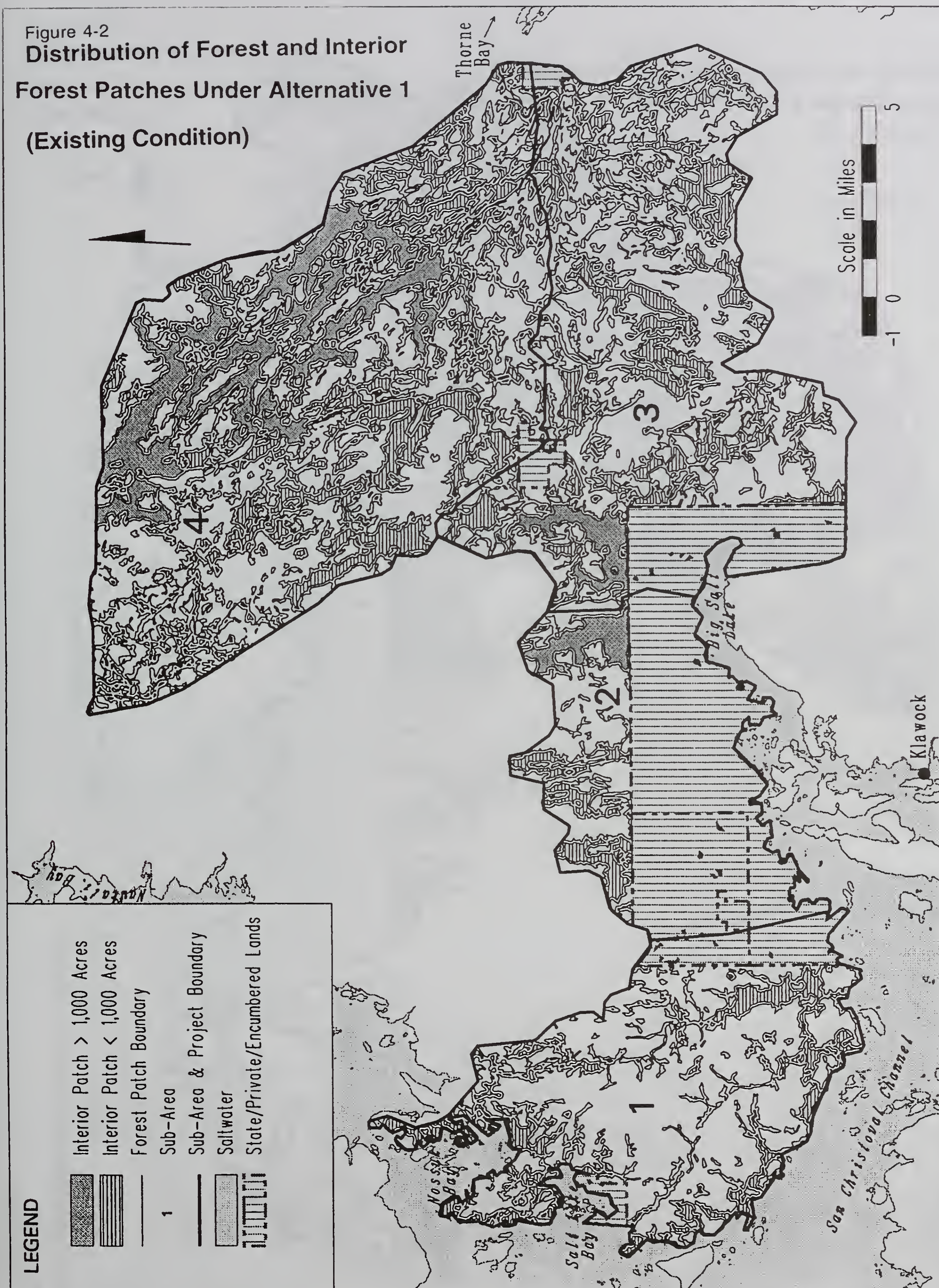
General losses of old-growth habitat would vary by volume class. Alternative 12 would represent the greatest impacts: 5.4 percent of volume class 4, 6.1 percent of volume class 5, 3.7 percent of volume class 6, and 1.2 percent of volume class 7 would be harvested. Alternative 10 would produce the lowest impacts: 1.7 percent of volume class 4; 1.8 percent of volume class 5; 0.4 percent of volume class 6; and 0.8 percent of volume class 7 would be harvested.

Forest Fragmentation

Forest fragmentation analysis determined the number of large (10,000 acres), medium (5,000 acres), and small (800 acres) patches (as defined in Chapter 3) that would be available in the Project Area following implementation of the proposed entry into Control Lake. Shifts from large patch size classes to smaller patch size classes would occur under the timber management alternatives. Figures 4-2 through 4-5 are detailed maps of forest and interior forest patch distribution by alternative. Each of the alternatives would result in similar declines in the percentage of forest habitat within the large patch size class and increases in the smaller size classes.

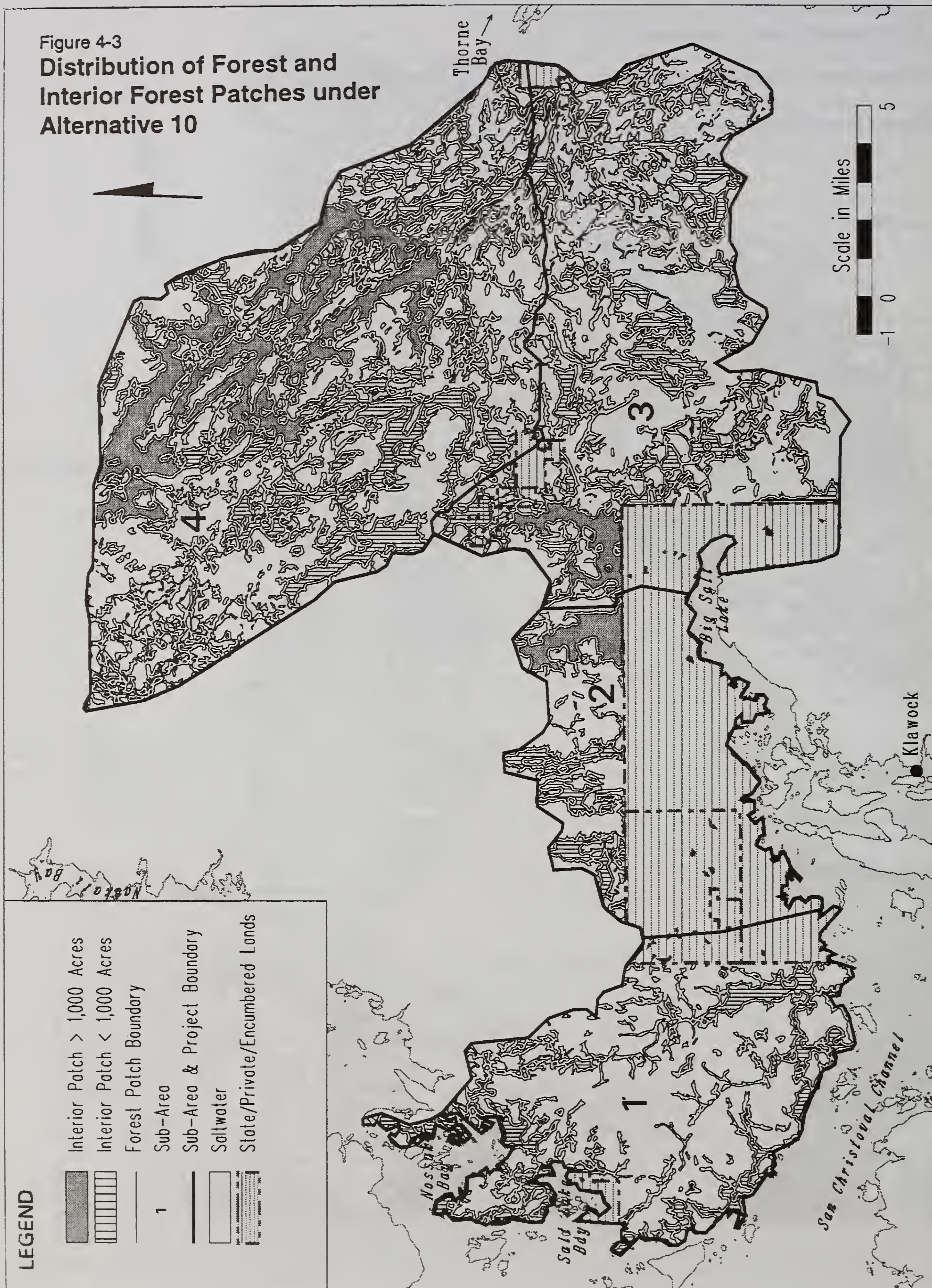
Under pre-logging conditions (1954), 48,275 acres of the old growth within the Project Area was contained in two patches greater than 10,000 acres in size. This was due to the linking of large old-growth patches by small corridors and linear patches of habitat. Conversely, no interior habitat patches larger than 5,000 acres existed in 1954, but 62 percent of the total interior area was contained in patches from 1,000 to 5,000 acres in size. By 1997 (existing conditions, Alternative 1), total forest area and interior forest area dropped significantly (Tables 4-42 and 4-43). Only 29,739 acres of old growth (one patch) remained in patches greater than 10,000 acres in size, due to the extent of harvest south of the 30 Road. Under the action alternatives, the total area of remaining forest patches greater than 10,000 acres would range from 29,056 acres for Alternative 12 to 29,739 acres for Alternative 10 (one patch). The action alternatives would produce a redistribution of interior habitat from larger to smaller patches (Table 4-43). Interior forest patches within the 1,000- to 5,000-acre size classes would be reduced by 1 percent for Alternative 10, by 16 percent for Alternative 11, and by 23 percent for Alternative 12.

Figure 4-2
Distribution of Forest and Interior Forest Patches Under Alternative 1 (Existing Condition)



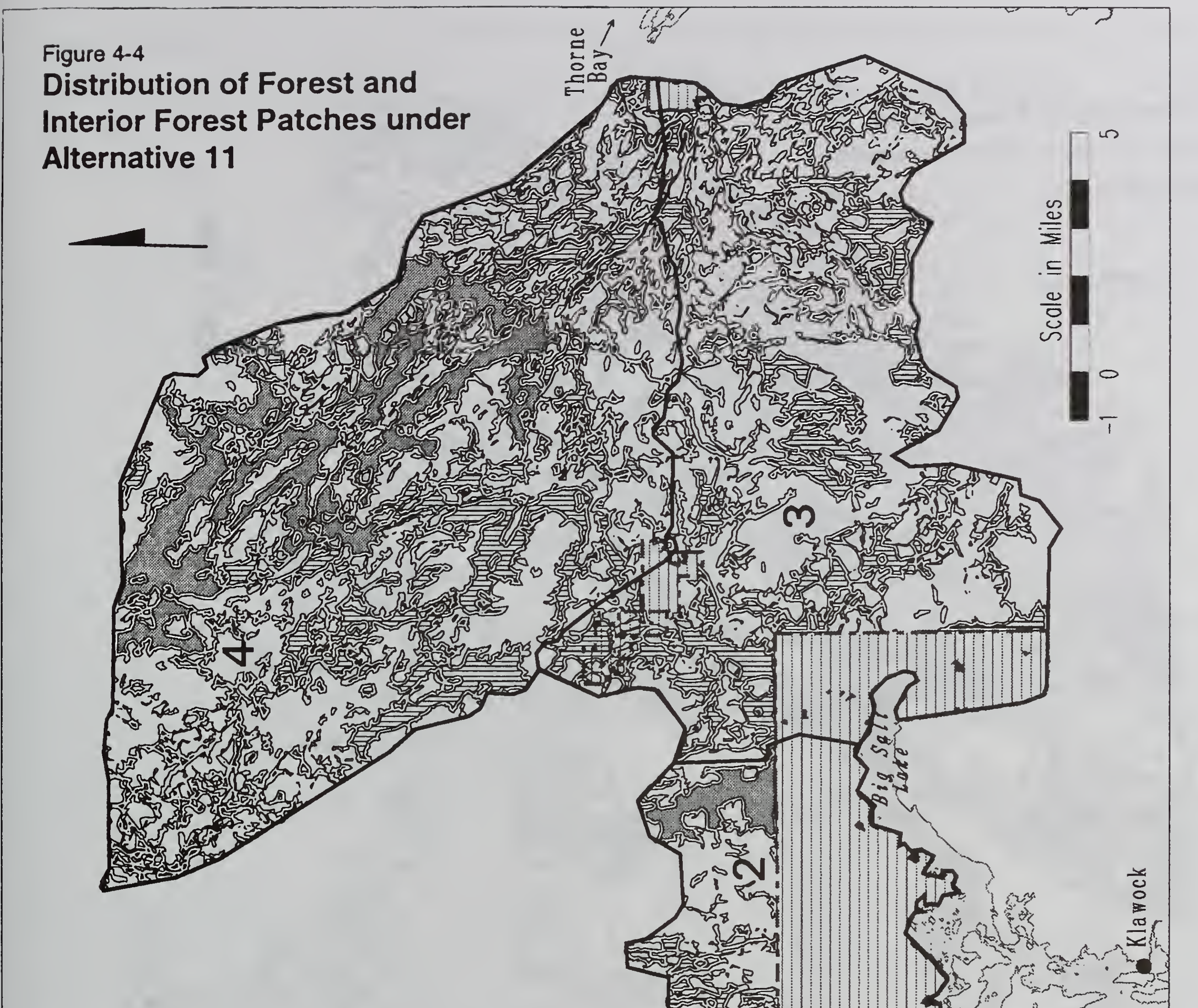
/glacier3/controllk/amls/post8x11/patch94
June 09, 1995

Figure 4-3
Distribution of Forest and Interior Forest Patches under Alternative 10



/adams1/controllk/amls/post8x11/new-patch98.aml - p98alt10.ps
November 12, 1997

Figure 4-4
Distribution of Forest and Interior Forest Patches under Alternative 11



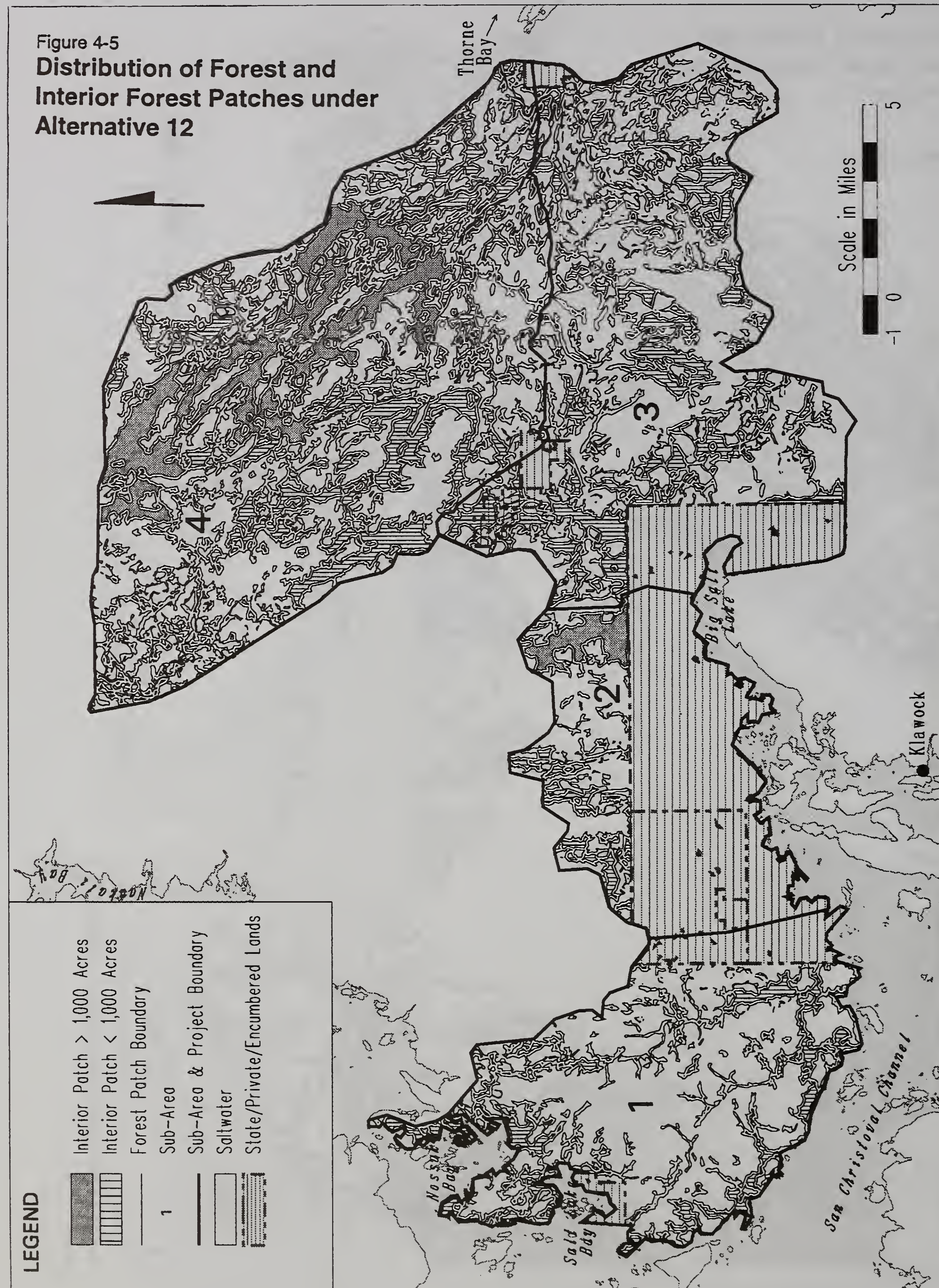


Figure 4-5
Distribution of Forest and Interior Forest Patches under Alternative 12

/adams1/controllk/amls/post8x11/new-patch98.aml - p98alt12.ps
November 12, 1997

Table 4-42
Area (Acres) in Forest Patches by Size Class for the Alternatives

Size Classes	1954	Alt. 1	Alt. 10	Alt. 11	Alt. 12
0-20	1,446	1,823	1,915	2,117	2,207
20-50	2,387	2,602	2,528	2,647	2,570
50-100	1,784	2,239	2,101	2,036	1,960
100-500	3,326	4,908	4,752	6,832	6,717
500-1,000	2,420	3,467	5,194	3,642	3,612
1,000-5,000	18,315	24,785	22,409	20,402	20,135
5,000-10,000	8,260	6,598	6,405	5,948	5,948
>10,000	48,275	29,739	29,739	29,342	29,056
Total	86,213	76,161	75,043	72,966	72,205

Table 4-43
Area (Acres) in Interior Forest Patches by Size Class for the Alternatives

Size Classes	1954	Alt. 1	Alt. 10	Alt. 11	Alt. 12
0-20	1,422	1,833	1,797	1,802	1,762
20-50	1,154	1,457	1,405	1,637	1,728
50-100	2,249	2,174	2,136	2,160	2,392
100-500	6,770	6,662	6,466	5,652	6,074
500-1,000	2,181	3,099	2,579	2,992	2,370
1,000-5,000	22,069	10,210	10,065	8,557	7,828
5,000-10,000	0	0	0	0	0
>10,000	0	0	0	0	0
Total	35,846	25,435	24,448	22,820	22,154

Overall, Alternative 10 results in the lowest fragmentation of large forest patches, and Alternative 12 results in the highest. This pattern holds true for both total and interior forest patches. The largest patches would remain in the Honker Divide and Hatchery Creek area, Cutthroat Lakes, and north of Big Salt Lake.

Patch-size Effectiveness

Table 4-44 displays the results of patch-size effectiveness for deer, marten, sapsuckers, hairy woodpeckers, and brown creepers. The patch-size effectiveness for the action alternatives ranges from 88.2 to 89.8 percent for deer, 93.1 to 93.8 percent for marten, 94.2 to 94.8 percent for sapsuckers, 89.9 to 91.3 percent for hairy woodpeckers, and 98.9 to 99.1 percent for brown creepers. Alternative 12 ranks lowest and Alternative 10 ranks highest among the action alternatives for all species.

Table 4-44
Patch-size Effectiveness Values for Five Management Indicator Species, by Alternative

		Alternatives			
		1	10	11	12
Species	1954	1997	2000	2000	2000
Sitka black-tailed deer	0.932	0.901	0.898	0.882	0.882
Marten	0.954	0.938	0.938	0.932	0.931
Red-breasted sapsucker	0.963	0.949	0.948	0.943	0.942
Hairy woodpecker	0.928	0.914	0.913	0.899	0.899
Brown creeper	0.994	0.991	0.991	0.990	0.989

Source: USDA Forest Service, Ketchikan Area GIS Database.

Population Viability

Maintenance of viable wildlife populations well distributed across National Forest System lands, where multiple-use management is emphasized in the resource planning process, should be soundly based on conservation biology principles. To accomplish this, biologists indicate that sufficient amounts of suitable habitat areas should remain well distributed across the Tongass National Forest. The Forest Plan Revision (TLMP 1997) incorporates a variety of measures including an old-growth habitat conservation strategy and species-specific management prescriptions designed to maintain well-distributed viable populations across the Tongass (see *Cumulative Effects* section).

Under the 1997 TLMP Revision, the expanded use of Old Growth Habitat LUD's in the Project Area will increase the acreage and connectivity of old-growth habitat. The distribution of LUD's that prohibit timber harvest is shown in Figure 1-5 in Chapter 1 and on the large map accompanying this EIS. Under the new TLMP, the size of the protected Honker Divide block would be substantially increased and smaller blocks would be protected in the Rio Roberts, Rio Beaver, and Election Creek watersheds. An expanded Semi-Remote Recreation LUD in the Elevenmile area would serve as old-growth retention also. Connectivity would stretch from the Karta Wilderness to the south of Control Lake, at least to the Sarkar Lakes and Whale Pass areas to the north.

Cumulative Effects

At the end of the first rotation in 2054, it is assumed that all suitable and available commercial forest land (based on the TLMP, 1997) will have been harvested, and 53,239 acres will remain (see *Wildlife*, Cumulative Effects). Landscape-level biodiversity would decline within the Control Lake Project Area by 2054, but well-distributed viable populations would be maintained across the Tongass.

The old-growth habitat conservation strategy and species-specific management prescriptions of the new Forest Plan (TLMP, 1997) represent a balance of wildlife habitat conservation measures which consider the best available scientific information. These measures are designed to provide for fish and wildlife habitat that will maintain well-distributed viable populations of vertebrate species and maintain the diversity of plants and animals across the Tongass.

The old-growth habitat conservation strategy incorporated into the new Forest Plan, consists of two basic components: (1) a forest-wide reserve network, and (2) a matrix management strategy. The forest-wide reserve network protects the integrity of the old-growth forest. It

includes a series of large, medium, and small old-growth reserves. The Forest Plan will fully protect 70 percent of the productive old-growth forest on the Tongass in some form of nondevelopment LUD. The North Prince of Wales province has 50 percent of the current productive old growth in reserves.

The second component of the old-growth conservation strategy is management of lands with LUD allocations where commercial timber harvest may occur. Within areas, components of the old-growth ecosystem are maintained by standards and guidelines designed to protect important areas and provide old-growth forest habitat connectivity. The 1,000-foot beach estuary fringe and riparian buffers are the primary management prescriptions, but standards and guidelines that restrict harvest on high-hazard soils, steep slopes, karst terrain, visually sensitive travel routes and use areas, and timber stands not technically feasible to harvest, also contribute significantly to maintaining old-growth ecosystems.

The wildlife and biodiversity cumulative effects analyses recently developed in the Final EIS (and Appendix N) for the new Forest Plan (USDA Forest Service, 1997) and summarized in the Record of Decision, is incorporated by reference.

Mitigation

Mitigation measures relating to wildlife and threatened, endangered, and sensitive species are applicable to biodiversity. These mitigation measures are discussed in the *Wildlife* and *Threatened, Endangered, and Sensitive Species* sections.

Monitoring

Monitoring activities relating to wildlife and threatened, endangered, and sensitive species are applicable to biodiversity. These monitoring activities are discussed in the *Wildlife* and *Threatened, Endangered and Sensitive Species* sections.

This page intentionally left blank.

Lands

Key Terms

Alaska Native Claims Settlement Act (ANSCA)—provides for the settlement of certain land claims of Alaska Natives.

Encumbrance—a claim, lien, charge, or liability attached to and binding real property.

Native selection—application by Native corporations to the USDI Bureau of Land Management for conveyance of a portion of lands withdrawn under ANSCA in fulfillment of Native entitlements established under ANSCA.

Special use permits—permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.

State selection—application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Harvest Units Adjacent to Non-national Forest System Lands

No proposed harvest units with any of the alternatives would be located on the boundary between Forest Service and non-National Forest System land. There would be a maximum of 12 harvest units in the Project Area that would be located within 0.25 mile of non-National Forest System lands with Alternative 12. The units are displayed in Table 4-45. Alternative 10 would have only 2 units located within 0.25 mile of non-National Forest System lands. All units would have boundary lines established prior to implementation to ensure that harvest does not encroach on non-National Forest land.

Table 4-45

Proposed Harvest Units Adjacent to or Within 0.25 Mile of Non-National Forest System Lands

Harvest Unit	Location	Adjacent Owner	Alternatives That Include Unit
593-421	Elevenmile Creek	Sealaska	12
593-424	Elevenmile Creek	Sealaska	12
593-431	Elevenmile Creek	Sealaska	11, 12
594-416	Kogish Mountain Area	Sealaska	11, 12
594-419	Kogish Mountain Area	Sealaska	10, 11, 12
594-420	Kogish Mountain Area	Sealaska	10, 11, 12
595-402	Control Lake	State of Alaska	11, 12
595-403	Control Lake	State of Alaska	11, 12
595-412	Steelhead Creek	Sealaska	11, 12
595-418	Steelhead Creek	Sealaska	11, 12
596-406	Control Lake	State of Alaska	11, 12
596-407	Control Lake	State of Alaska	11, 12

No units are within 0.25 mile of the Karta Wilderness, although three units are within 0.5 mile of the boundary (Table 4-46). Several units lie within 0.25 mile of restrictive LUD's under the 1997 TLMP Revision. These LUD's include the Rio Roberts RNA; the Semi-Remote Recreation Area near Salt Lake Bay, and Old Growth Habitat LUD's.

Table 4-46
Proposed Harvest Units Within 0.5 mile of the Karta Wilderness

Harvest Unit	Location	Alternatives that Include Unit
595-421	Steelhead Creek	11, 12
595-433	Steelhead Creek	10, 11, 12
597.2-449	Rio Roberts Creek	10, 11, 12

Rights-of-way and Land Use Agreements

Logging adjacent to non-National Forest System lands may require right-of-way or land use agreements for establishing roads, establishing tailholds, suspending logging cables over non-National Forest roads or lands, and for establishing new or reusing old LTF sites.

Eight units in VCU 594 near Kogish Mountain are currently planned to be accessed via Sealaska Native Corporation roads north of the Big Salt Lake. Other options for these units include tying the road system into the existing roads in the Staney Creek Watershed to the north. The eight units in question are listed in Table 4-47 by alternative.

Table 4-47
Proposed Harvest Units to be Accessed by Roads on Sealaska Lands North of Big Salt Lake

Harvest Unit	Location	Alternatives that Include Unit
594-401	Kogish Mountain Area	11, 12
594-407	Kogish Mountain Area	11, 12
594-409	Kogish Mountain Area	11, 12
594-410	Kogish Mountain Area	11, 12
594-415	Kogish Mountain Area	11, 12
594-416	Kogish Mountain Area	11, 12
594-417	Kogish Mountain Area	11, 12
594-418	Kogish Mountain Area	11, 12

To minimize impacts from harvest activities, it will be necessary to directionally fall timber away from non-National Forest lands. Tree felling requirements will be analyzed and negotiated on a case-by-case basis, depending on site-specific logging/transportation systems.

Land Use Designations

Timber harvest within the LUD's found in the Project Area would be consistent with the standards and guidelines established in the TLMP. Alternatives 11 and 12 would be entirely consistent with the new Forest Plan. Alternative 10 would include two units (596-421 and 597.1-401) that would be partially inconsistent with the revised TLMP (1997) and would require boundary modifications. See Chapter 1 for information concerning other comprehensive plans.

Special Use Permits

Harvest activities would be anticipated to start the year after the three mills that are operating with Special Use Permits would be expected to relocate off of National Forest System lands.

This page intentionally left blank.

Transportation and Facilities

Key Terms

A-frame LTF—log transfer facility system which consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.

Access management—the designation of roads for differing levels of use by the public.

Aquatic Habitat Management Unit (AHMU)—a mapping unit that displays an identified value for aquatic resources; a mechanism for carrying out aquatic resource management policy.

Arterial roads—roads usually developed and operated for long-term land and resource management purposes and constant service.

Endless chain LTF—log transfer facility system which consists of a gravity slide ramp for sliding log bundles into the water, with a chain assist system to slow the velocity of logs entering the water.

Collector roads—roads that collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.

Local roads—roads that provide access for a specific resource use activity such as a timber sale or recreational site; other minor uses may be served.

Log Transfer Facility (LTF)—a facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.

Main trunk roads—primary roads that are used repeatedly for forest access over long period of time.

Maintenance levels—levels at which roads are maintained (or closed) for various uses, including high-clearance vehicle and passenger vehicle use. See Glossary for more detail.

Modular bridge—a portable bridge constructed of components that can be readily assembled and disassembled for movement from one site to another.

Specified roads—a road, including related transportation facilities and appurtenances, shown on the Sale Area Map and listed in the Timber Sale Contract. These roads are constructed as permanent roads as part of the forest development transportation system.

Temporary roads—short term roads built for limited resource activity or other project needs.

Traffic service levels—traffic characteristics and operating conditions that are used in setting road maintenance levels.

Introduction

The effects of the transportation system on other resources are considered in the specific resource sections (e.g., *Soils; Watershed, Fish, and Fisheries; Wildlife; Recreation*). This section focuses on the effects of each alternative on the transportation system. The discussion is grouped into the following categories: (1) road development, (2) rock quarries, (3) maintenance level, (4) access management, and (5) logging camps and log transfer facilities.

Road Development

Table 4-48 displays the miles of new and reconstructed roads by alternative. Road reconstruction consists of roadbed and ditchline repairs, culvert or bridge replacement, and resurfacing. Alternative 12 would require the most miles of road construction. Alternative 10 would require the least miles of road.

Table 4-48
Miles of New and Reconstructed Road by Action Alternative

	Alternative 10		Alternative 11		Alternative 12	
	New	Recon.	New	Recon.	New	Recon.
574					0.3	
575			1.9	0.8	8.4	0.8
576	0.7		0.5		0.5	
577			4.7		8.2	
578			2.3		2.3	
591			2.9		2.9	
592						
593			8.1		13.3	
594	2.5		9.6		9.6	
595	9.6	0.8	16.9	1.0	17.8	1.0
596	2.2		5.2	1.2	5.8	1.2
597.1	1.2		0.7		3.2	
597.2	9.9	1.6	16.8	4.7	17.3	4.7
Outside Project Area	1.0		1.1		1.1	
Subtotal	27.1	2.4	70.7	7.7	90.7	7.7
Total New and Recon. (map miles)	29.5		78.4		98.4	

SOURCE: GIS query

Alternatives 11 and 12 have 8 units in VCU 594 that would be accessed from existing private (Sealaska) roads.

Typical forest road

Alternative 10, with 30 miles of road construction/reconstruction, would extend the road system primarily in the Steelhead Creek, Rio Beaver Creek, Shinaku Creek watersheds. The total length of individual new road extensions would not exceed about 4 miles.

Alternative 11, with 78 miles of road construction/reconstruction, would extend existing roads further into the Steelhead, Lower Logjam, Rio Roberts, Rio Beaver, and Shinaker and Elevenmile watersheds. The total length of individual new road extensions would not exceed about 6 miles.

Alternative 12, with 98 miles of road construction/reconstruction, would extend existing roads into the same watersheds as Alternative 11. However, roads would be extended further in the Elevenmile, Lower Logjam, and Upper Thorne watersheds. The total length of individual new road extensions would not exceed about 8 miles.

Three classes of road would be constructed as part of the proposed project, each of which has different projected uses and construction standards. The three classes are: arterial, collector, and local roads. Temporary roads, which are short-term roads for timber harvest activities only, were considered local roads for analysis purposes, since these roads are similar to local roads.

Arterial and collector roads are generally mainline system roads requiring higher standards and heavier investment to provide prolonged multiple use. These roads can be built to lower standards initially and upgraded as use is intensified. Thus the logging operator may construct arterial and collector roads to low or medium standards depending on use.

Local roads tend to be used intermittently, allowing use of lower construction standards, and local roads are generally less costly than the arterial and collector roads. These roads may have use restrictions during harvest activities that limit public access.

The number of miles of arterial, collector, and local roads to be constructed under each action alternative is shown in Table 4-49. Road class is shown by specific road segment in Appendix D of the Draft EIS.

Table 4-49

Miles of Road Construction/Reconstruction by Road Class and Alternative

Road Class	Alt. 10	Alt. 11	Alt. 12
Arterial	0	0	0
Collector	7	17	22
Local	23	61	76
Total	30	78	98

Existing roads would need to be reconstructed under all action alternatives. These activities range from major culvert and bridge replacement to minor blading and shaping of the existing road. Table 4-50 displays the cost of bridges and major culverts, road construction, road reconstruction, and the road cost in dollars per MBF.

Table 4-50
Required Road Construction and Reconstruction by Alternative

	Alt. 10	Alt. 11	Alt. 12
Road Construction (miles)	27.1	70.7	90.7
Road Reconstruction (miles)	2.4	7.7	7.7
Total Costs	**$3,830,000**	**$14,030,000**	**$17,470,000**
Road Cost ($/MBF)	**$101**	**$150**	**$154**

Construction Coordination with Fish and Wildlife

Development in some areas may require road construction or reconstruction near inventoried eagle nest trees. There is no road construction anticipated to be within 330 feet of any known eagle nest tree in the Project Area. It is standard practice to locate roads and other facilities at least 330 feet away from eagle trees unless terrain or physical requirements such as road grade prevent such an avoidance.

Some stream crossings have been identified as needing fish-timing restrictions for construction of structures, to minimize impact on fish young and fry. Generally, these restrictions can be accommodated through planning and scheduling of the construction activities. However, in many cases, additional costs would be incurred to accommodate the timing restrictions. Such costs would include additional equipment mobilization and demobilization and increased construction actions for mitigation. For these road and/or units, it may be necessary to conduct multiseason road construction and harvest. The restriction period for fish is a combination of coho, pink and chum, sockeye, and steelhead restrictions. Streams with these timing restrictions would be surveyed prior to implementation to determine species use. The District Fish and Wildlife Biologist would be consulted during the year of activity to determine final timing restrictions, based on use of the area by the species of concern, and to determine if waivers or variances are necessary. The objective is to provide a reasonable operating window while still meeting the specific resource objectives.

The Thorne Bay Ranger District has developed several options to increase the length of the construction window, based on previous project experience. These include installation of a log stringer bridge, which allows equipment across a creek without any instream construction; on small, nonfish bearing streams, dam and divert water around the site during culvert placement and rocking; install culverts or bridges during low flow periods or when streams are frozen. Consultation with the District Fish and Wildlife Biologist would be necessary to determine appropriate options for each site.

Rock Quarries

Generally, rock quarries are located every 1 to 2 miles along roads. The quarry location is determined by the quality of the rock sources, haul distances, development costs, frequency of entry, and visual resource considerations. An allowance for rock quarries is included in the acres shown for road right-of-way clearing (see *Soils* section in this chapter).

Some rock quarries are small and would involve one-time uses, while others would be expanded during future road building operations if quality rock is available. Rock quarries with expansion potential would be retained for expansion, particularly in situations where potential roads and timber harvest may be developed in the future, or where numerous roads radiate out from a point near a centralized quarry. Rock quarries near the ends of the road system would be closed and reclaimed by spreading stockpiled overburden on the floor of the quarry.

Each quarry would be evaluated for disposition during the construction stage. Each quarry would be evaluated for the following: (1) availability of additional quality rock, (2) feasibility of expansion, (3) future rock resource needs in the area, and (4) proposed VQO's.

Maintenance Level

Public access would continue under all action alternatives and would be increased due to additional road mileage. Specifically, access into the Rio Beaver and Steelhead creek watersheds would continue. New access would be provided to areas near Kogish Mountain from both the west and east.

Table 4-51 shows the traffic service levels associated with road maintenance levels by alternative for road construction or reconstruction. Maintenance levels and traffic service levels are shown by specific road segment in Appendix D of the Draft EIS.

Table 4-51

Miles of Road by Traffic Service Level by Alternative

Traffic Service Level	Alt. 10	Alt. 11	Alt. 12
Level C	7	17	22
Level D	23	61	76
Total	30	78	98

Generally, collector roads would remain open for ongoing silvicultural activities. Maintenance of these roads would consist of monitoring road and drainage structures for function and environmental condition. Maintenance levels would fluctuate in response to changing uses. During periods of limited use, maintenance standards are sufficient to provide only for public safety and resource protection (i.e., Maintenance Level 2 and Traffic Service Level C). This level road is maintained for high clearance vehicles and passenger car traffic is not a consideration.

Many local roads to harvest units, including the short road segments for yarders within harvest units, would not be retained as part of the permanent transportation system. These roads receive Maintenance Level 1 and Traffic Service Level D. After these roads have served their intended purpose, the roadbed would be effectively blocked to normal vehicular traffic, the drainage structures removed, and the roadbed would be waterbarred. Some of these roads are temporary but are considered here as local roads. Because such roads may be constructed through rock, they cannot easily be reclaimed.

Access Management

Specific post-harvest traffic strategies or access management are described below with regard to fisheries, wildlife, and recreation concerns. Access might be encouraged, accepted, discouraged, eliminated, prohibited, or prohibited seasonally. Access into newly entered drainages would be discouraged or eliminated to minimize wildlife impacts unless there is a specific recreational opportunity. Roads are closed for several reasons, including fish and wildlife protection, and inadequate maintenance funding. Roads under Forest Service jurisdiction can be closed by authority of CFR 36, Chapter 11, Parts 212.7 and 261. Road closure orders would be posted at the Thorne Bay Ranger District Office. Because U.S. mining laws confer a statutory right to enter public lands to search for minerals, access to mining claims would not be restricted. However, miners and prospectors would be required to obtain a permit to use restricted roads.

Depending on the alternative selected, 22 (Alt. 10), 52 (Alt. 11), or 62 (Alt. 12) miles of newly constructed roads are proposed for closure following completion of harvest activities. In addition, up to 56 miles of existing roads are proposed for closure under all alternatives. These road closures are shown in the access strategy map at the end of Chapter 2 and in the large-scale color map accompanying this EIS. Closure of existings roads will be based in part on comments received during public involvement efforts for the Supplemental Draft EIS.

Motorized road access to several areas within the Control Lake Project Area would be eliminated because of the sensitivity of fisheries, wildlife, and subsistence resources. Motorized vehicle restrictions include passenger vehicles, four- and three-wheel sport vehicles, and motorcycles. The areas of primary concern are the Elevenmile Creek area for subsistence and in the Honker, Rio Roberts, Rush Peak, and Election Creek Old Growth Habitat reserves. In addition, new roads would be closed in the Logjam Creek watershed due to wildlife concerns, including goshawk and wolf.

In areas where long-term timber management is planned, some roads would be left open, primarily to provide for timber harvest, salvage, firewood, free use, and other management activities. For example, the road entering the west side of VCU 594 south of Kogish Mountain, the road near Angel Lake in VCU 597.2, and most roads in Rio Beaver and Steelhead Creek watershed would be left open for these reasons. In some cases open roads may be seasonally closed to reduce hunting and trapping pressure or during sensitive periods for wildlife (e.g., nesting, denning).

Logging Camps

The community of Thorne Bay would serve the majority of the Project Area, using the Thorne Bay LTF and sort yard. The communities of Klawock and Craig would also provide living quarters for loggers. The private LTF at Klawock has not been used by KPC for the 1989-1994 sale. The community of Coffman Cove would serve the northeast portion of the Project Area.

The site at Naukati could service the western and northwestern portions of the Project Area, using the Naukati and Winter Harbor LTF's. No new camps would be constructed to serve the Project Area.

Table 4-52 shows the estimated volume, by alternative, to be serviced through each community or logging camp in MBF.

Table 4-52
Estimated Timber Volume (MMBF) Serviced by Logging Community

	Alternative		
Location	10	11	12
Thorne Bay	31.8	74.4	87.0
Coffman Cove	0	1.3	2.6
Naukati	5.9	17.9	23.7
Totals	37.7	93.6	113.3

Log Transfer Facilities

There are currently five LTF's available to serve the Project Area. These LTF's are located at Winter Harbor (on Tuxekan Passage), Coffman Cove (near Kasheverof Strait), Naukati (also on the Tuxekan Narrows), Thorne Bay (at Thorne Bay), and at Klawock (on Klawock Inlet). The LTF in Klawock is privately owned and is available for use on a fee basis. This LTF has not been used for the 1989-1994 sale and is not planned for this operating period.

All four of the LTF's proposed for the Project Area are existing and permitted. Under the No Action Alternative, use of these existing LTF's would continue. Table 4-53 shows the estimated volume of timber to be moved through each LTF by alternative.

Table 4-53
Estimated Timber Volume (MMBF) Handled by Log Transfer Facility

	Alternative		
Location	10	11	12
Thorne Bay	31.8	74.4	87.0
Coffman Cove	0	1.3	2.6
Winter Harbor	5.9	16.1	21.9
Naukati	0	1.8	1.8
Totals	37.7	93.6	113.3

Typical LTF

The major potential impact involving LTF's is the accumulation of log debris in the marine environment. During the transfer of logs from land to water, bark would be sloughed off and could be deposited on the ocean bottom; bark also is continually sloughed off by agitation by wind and waves while logs are in rafts. Bark accumulation on the bottom can diminish habitat for bottom-dwelling crustaceans and mollusks, as well as hamper underwater vegetation used as food and rearing sites for marine fish and other organisms. The discharge of bark into the water at an LTF is a discharge requiring a National Pollution Discharge Elimination System (NPDES) permit. The environmental effects from this timber entry will be limited to that allowed under the existing permits and their required monitoring. Based on timber volumes, the environmental effects will be greatest for the Thorne Bay LTF, followed by Naukati and Coffman Cove. This relationship holds for all alternatives.

Monitoring

Road monitoring tasks are contained in the Ketchikan Area Monitoring Strategy (USDA Forest Service, 1994). Road monitoring is also discussed in the *Soils* and the *Water, Fish, and Fisheries* sections.

This page left intentionally blank.

Economic and Social Environment

Key Terms

Cant—a squared log destined for further processing.
Discounted benefits—the sum of all benefits derived from the Project Area over the life of a project.
Discounted costs—the sum of all costs incurred from the Project Area during the life of the project.
Mid-market—the value and product mix represented at the quarter in which the pond log value (end-product selling price less manufacturing cost) for the species and product mix most closely matches the point between the ranked quarters of the Alaska Index Operation pond log value, adjusted to Common Year Dollars, where one half of the harvest of timber from the Tongass National Forest has been removed at higher values and one half of the timber has been removed at lower values, during the period from 1979 to the current quarter (FSH 2409.22 R10 Chapter 531.1-2).
Present Net Value (PNV)—the difference between total discounted benefits and total discounted costs associated with the alternatives.

Introduction

When comparing the alternatives that produce similar results, economic analysis is useful. In preparation of the EIS, the Forest Service is mandated to consider a range of alternatives for accomplishing a specific project and determine their respective costs and benefits. The rationale behind this mandate is that the decision to utilize scarce public natural resources requires balanced and thoughtful deliberation among management actions that affect the quality of the environment. Central to the analysis process is the concept of value, which is represented by the monetary value of the costs and benefits derived from using natural resources. In essence, the Forest Service manages a portfolio of public assets, and by selecting a specific course of action, the Forest Service uses capital in the form of stumpage value, or the value per acre of logs, to help defray forest management expenses.

Southeast Alaska citizens rely on the availability of natural resources from the Tongass National Forest. Their economic well-being and livelihood are inextricably tied to these resources. The Forest Service is required by the National Forest Management Act (NFMA, 1976), and Forest Service policy and manual direction to perform economic efficiency and economic equity or distributional analysis as part of the National Environmental Policy Act (NEPA) process. Economic efficiency is concerned with getting the most output for each dollar spent. Economic equity is concerned with who benefits from (jobs, tax base) and who pays for forest management activity.

Economic Evaluation

The economic impacts of the Control Lake Project Area alternatives can be evaluated in a number of ways. The value of the standing timber or "stumpage value" is evaluated. Stumpage value is the amount of compensation the Forest Service receives when the timber is harvested and is a measure of economic efficiency. In addition to returns to the U.S. Treasury, stumpage values indirectly affect fiscal conditions in local communities through payments to the State. PNV is used to determine public investment viability. PNV is the difference between the discounted value of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the area. PNV is useful in analyzing investments in timber harvest activities and capturing the benefits and costs that are realized over a period of time. From a social welfare perspective, the volume of timber available for harvest under each alternative supports a different level of job opportunities in timber-related industries. A more detailed analysis of these important economic indicators is included in the following discussion.

Economic Efficiency Assessment

Determining the economic efficiency of each timber sale offering is an important step in the Forest Service planning process. Forest Service policy and handbook direction (FSH 2409.18) requires an economic efficiency assessment to compare benefits and costs of each proposed timber sale project and to determine if the sale would be a positive economic offering. This economic efficiency analysis is performed by comparing expected gross revenues to estimated costs and arriving at an estimate of future net revenues.

Pond log values represent the delivered price of logs at the mill minus the cost to manufacture them into usable products. Pond log values were determined based on the mid-market value, which is a weighted median of historic quarterly pond log values. This is done to account for fluctuations in market prices. However, because recent market trends have resulted in significant fluctuations of timber prices, a high-end rate reflecting recent prices was also used in the assessment.

Logging, or stump to truck costs, vary by volume class (indices of the average quantity of timber per acre) mainly due to the size of the logs yarded. In general, the higher the volume per acre, the larger the logs; thus, the logging costs per MBF are lower. Species composition is an important variable to consider when estimating timber value. For example, Volume Class 4, which has the lowest average volume per acre, often contains a large proportion of yellowcedar that is exportable in log form and has high pond log value. Logging costs in this analysis are equivalent to all stump to truck cost centers used in the Region 10 appraisal process to harvest timber. Therefore, logging costs include timber falling, bucking, yarding, sorting, and loading. As part of the analysis, the assumption of an operator of average efficiency is used to appraise timber sales.

Stumpage value indicates Forest Service receipts from timber sold. For this assessment, stumpage value was calculated by subtracting estimated logging, transportation, and road construction costs from the pond log value. Additionally, an allowance of 60 percent of normal profit and risk was also included as a cost and subtracted from pond log values per Forest Service Handbook 2409.18.

Table 4-54 displays the results of the economic efficiency assessment for the action alternatives. The assessment indicates that all the action alternatives would produce negative stumpage values using mid-market prices; however, using current timber prices, all of the stumpage values would be positive. Alternative 12 has the lowest stumpage values and Alternative 10 has the

highest. The high stumpage value for Alternative 10 is primarily tied to its alternative framework which included minimizing new road construction; thus, road costs are substantially lower per MBF for Alternative 10 relative to the other Alternatives.

Table 4-54
Economic Efficiency Assessment

	Alt. 10	Alt. 11	Alt. 12
Total Volume (MBF)	37,733	93,612	113,274
Pond Log Value Per MBF (Mid-Market)1/	$300.80	$298.84	$296.17
Pond Log Value Per MBF (High Value)1/	$521.00	$521.00	$521.00
Logging Costs Per MBF	$172.03	$164.65	$163.23
Transportation Costs Per MBF	$ 69.92	$ 69.11	$69.48
Road Costs Per MBF	$149.91	$149.91	$154.23
Direct Costs Per MBF2/	$343.44	$383.67	$386.94
60% Profit Margin Per MBF	$48.03	$47.72	$47.85
Net Stumpage Value3/ Per MBF (Mid-Market)	($90.67)	($133.95)	($138.62)
Net Stumpage Value3/ Per MBF (High Value)	$129.53	$89.69	$86.21

1/ Pond log values: Mid-market is based on a 10-year weighted median of historic values and actual species composition in each alternative; high value is based on 1st quarter 1995 values and average Forest-wide species composition.

2/ Direct costs = Total logging costs and total transportation.

3/ Net stumpage value = Pond log value - total direct costs - 60% profit margin.

Prior to the time each sale is offered, each unit and road will be cruised by the Forest Service to accurately determine the quantity, quality, and value of timber. A formal appraisal and timber sale report will be prepared incorporating current quarter selling values and cost information plus a normal profit and risk margin using the assumption of an operation of average efficiency. Site-specific environmental investments, for example, reforestation of yellowcedar by hand planting in clearcut units, will be included in KV sale area improvement plans, timber sale appraisals, and contracts. The purpose of this appraisal is to establish a framework in which a minimum acceptable selling value can be estimated.

Tables 4-55 through 4-57 show a detailed breakdown of the economic efficiency assessment for each component tributary or geographic area within each alternative. The determination of 6 component tributary areas was based on the LTF to which the logs would be hauled. The six areas are identified as Big Salt, Coffman Cove, Naukati, Rio, Thorne Bay, and Winter Harbor. Big Salt, Rio and Thorne Bay are tributary to the Thorne Bay LTF. Coffman Cove, Naukati, and Winter Harbor each have their own LTF. The purpose of performing an economic efficiency assessment on different tributary areas is to increase the level of site specificity of the analysis, and assess the individual economic viability of each geographic area in the context of the overall alternative.

Table 4-55
Summary of Economic Assessment for Alternative 10 by Geographic Area

	Big Salt	Coffman Cove	Naukati	Rio	Thorne Bay	Winter Harbor	Total
Unit Volume (MBF)	8,717	0	0	21,317	0	5,628	35,662
Road Volume (MBF)	919	0	0	869	0	284	2,071
Total Volume (MBF)	9,636	0	0	22,186	0	5,912	37,733
Pond Log Value Per MBF (Mid-market)[1/]	$284.81	-	-	$289.84	-	$367.99	$300.80
Pond Log Value Per MBF (High values)[1/]	$521.00	-	-	$521.00	-	$521.00	$521.00
Logging Costs Per MBF	$235.50	-	-	$133.19	-	$214.35	$172.03
Transportation Costs per MBF	$ 97.21	-	-	$ 57.60	-	$71.71	$69.92
Road Costs Per MBF	$183.39	-	-	$ 67.06	-	$ 97.18	$101.49
Direct Costs Per MBF[2/]	$516.09	-	-	$257.85	-	$383.23	$343.44
60% Profit Margin Per MBF	$46.86	-	-	$48.17	-	$49.44	$48.03
Net Stumpage Value[3/] Per MBF (Mid-market)	($278.14)	-	-	($16.18)	-	($64.68)	($90.67)
Net Stumpage Value[3/] Per MBF (High values)	$41.95		-	$214.98	-	$88.33	$129.53

Source: Analyses in project planning record.

1/ Pond log value: Mid-market is based on a 10-year weighted median of historic values and actual species composition in each geographic area; High-value is based on 1st quarter 1995 values and average Forest-wide species composition.

2/ Direct costs = Total logging costs and total transportation costs

3/ Net stumpage value = Pond log value - total direct costs - 60% profit margin

Table 4-56
Summary of Economic Assessment for Alternative 11 by Geographic Area

	Big Salt	Coffman Cove	Naukiti	Rio	Thorne Bay	Winter Harbor	Total
Unit Volume (MBF)	29,727	1,203	1,604	31,456	9,728	15,524	89,242
Road Volume (MBF)	2,101	117	167	1,036	386	563	4,370
Total Volume (MBF)	31,828	1,320	1,771	32,492	10,114	16,087	93,612
Pond Log Value Per MBF (Mid-market)[1/]	$302.38	$296.62	$260.87	$284.60	$304.20	$312.97	$297.36
Pond Log Value Per MBF (High values)[1/]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Logging Costs Per MBF	$164.44	$119.71	$111.28	$138.29	$206.35	$201.68	$164.65
Transportation Costs per MBF	$82.68	$64.46	$84.80	$58.50	$54.30	$71.65	$69.11
Road Costs Per MBF	$149.99	$366.29	$226.26	$139.35	$88.93	$183.23	$149.91
Direct Costs Per MBF[2/]	$397.11	$550.46	$422.34	$336.14	$349.58	$456.56	$383.67
60% Profit Margin Per MBF	$46.64	$49.75	$46.91	$47.86	$46.56	$49.75	$47.64
Net Stumpage Value[3/] Per MBF (Mid-market)	($141.37)	($303.59)	($208.38)	($99.40)	($91.94)	($193.34)	($133.95)
Net Stumpage Value[3/] Per MBF (High values)	$77.25	($79.21)	$51.75	$137.00	$124.86	$14.69	$89.69

Source: Analyses in project planning record.

1/ Pond log value: Mid-market is based on a 10-year weighted median of historic values and actual species composition in each geographic area; High-value is based on 1st quarter 1995 values and average Forest-wide species composition.

2/ Direct costs = Total logging costs and total transportation costs

3/ Net stumpage value = Pond log value - total direct costs - 60% profit margin

Table 4-57
Summary of Economic Assessment for Alternative 12 by Geographic Area

	Big Salt	Coffman Cove	Naukati	Rio	Thorne Bay	Winter Harbor	Total
Unit Volume (MBF)	30,260	2,246	1,604	35,372	17,204	20,978	107,664
Road Volume (MBF)	2,157	371	167	1,241	783	891	5,610
Total Volume (MBF)	32,417	2,617	1,771	36,613	17,987	21,869	113,274
Pond Log Value Per MBF (Mid-market)[1/]	$302.09	$314.42	$260.87	$283.97	$317.18	$298.26	$296.17
Pond Log Value Per MBF (High values)[1/]	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00	$521.00
Logging Costs Per MBF	$163.75	$111.74	$111.28	$142.19	$180.82	$203.59	$163.23
Transportation Costs per MBF	$82.47	$67.10	$84.80	$57.74	$57.04	$73.82	$69.48
Road Costs Per MBF	$151.75	$443.26	$226.26	$138.26	$122.53	$179.66	$154.23
Direct Costs Per MBF[2/]	$397.97	$622.10	$422.34	$338.19	$360.39	$457.07	$386.94
60% Profit Margin Per MBF	$46.85	$48.94	$46.91	$47.74	$46.78	$50.74	$47.85
Net Stumpage Value[3/] Per MBF (Mid-market)	($142.73)	($356.62)	($208.38)	($101.96)	($89.99)	($209.55)	($138.62)
Net Stumpage Value[3/] Per MBF (High values)	$76.18	($150.04)	$51.75	$135.07	$113.83	$13.19	$86.21

Source: Analyses in project planning record.

1/ Pond log value: Mid-market is based on 10-year weighted median of historic values and actual species composition in each geographic area; High-value is based on 1st quarter 1995 values and average Forest-wide species composition.

2/ Direct costs = Total logging costs and total transportation costs

3/ Net stumpage value = Pond log value - total direct costs - 60% profit margin

This analysis demonstrates some important characteristics of the different geographic areas. The Rio geographic area has the highest net stumpage value in all alternatives, primarily because of low road construction costs due to the presence of an existing network of roads. Conversely, the Winter Harbor and Coffman Cove area produce the lowest net stumpage values in each alternative primarily because of high road construction and/or logging costs. The Thorne Bay area generally ranks near or at the top due to relatively low logging and road costs. The Naukati area is generally intermediate in terms of net stumpage value. Table 4-58 summarizes net stumpage values, based on recent high timber prices, for each geographic area.

Table 4-58
Summary of Net Stumpage Values (per MBF) by Geographic Area (based on high timber prices)

	Alternative		
Geographic Area	10	11	12
Big Salt	($41.95)	$77.25	$76.18
Coffman Cove	-	($79.21)	($150.04)
Naukati	-	$51.75	$51.75
Rio	$214.98	$137.00	$135.07
Thorne Bay	-	$124.86	$113.83
Winter Harbor	$88.33	$ 14.69	$13.19
Total	$129.53	$89.69	$86.21

Variances in volume per acre, species mix, logging systems, log-haul distance, road construction and reconstruction costs, camp mobilization costs, and profit and risk allowances affect both the pond log values and logging, transportation, and construction costs. Costs and revenues used in the assessment represent averages for each sale area. Although individual units, or even entire sales, may not be economical to harvest by themselves, the management of less productive lands or lands containing a high percentage of defective timber will help to increase future timber yields. The harvest of units with higher returns will help compensate for those that are less economical.

Public Investment Analysis

Public investment analysis of the timber harvest alternatives incorporates the concept of the time value of money or PNV. Present-day costs and management expenses are subtracted from net stumpage revenues (stumpage receipts obtained from the economic efficiency analysis). These costs and management expenses include planning, sale preparation, harvest administration, reforestation, timber standard improvement, general and program administration, facilities depreciation, and regional land line location. These costs are distributed on a per acre basis. Use of this method allows for comparison of harvest efficiency as it rewards maximization of harvest volume or efficiency in conjunction with minimization of acreage disturbance. Therefore, public investment analysis allows Forest Service administrators to make valid economic comparisons among alternatives. The use of PNV's allows for the derivation of the harvest efficiency of an alternative. The use of PNV's is useful in identifying the minimum acceptable return on investment for the four alternatives. Table 4-59 presents the results of a preliminary PNV analysis for the alternatives. The preliminary PNV's are all similar.

Table 4-59
Public Investment Summary

	Alt. 10	Alt. 11	Alt. 12
FOREST SERVICE REVENUES			
Volume (MBF)	37,733	93,612	113,274
Net Stumpage Value[1/] Per MBF (High values)	$129.53	$89.61	$86.21
Total Pond Log Value	$4,887,555	$8,388,571	$9,765,352
FOREST SERVICE FIXED COSTS			
Acres	1,281	3,613	4,452
Forest Service Pre-Harvest Costs (per acre)[2/]	$1,554.20	$1,554.20	$1,554.20
Forest Service Pre-Harvest Costs	$1,990,930	$5,615,325	$6,919,298
PRESENT NET VALUE (PNV)	$2,896,625	$2,773,247	$2,846,054

1/ High value is based on 1st quarter 1995 values and average Forest-wide species composition.

2/ Forest Service costs include sale preparation, timber planning, silvicultural exams, harvest administration, general and program administration, facilities depreciation, and regional land line location. They are based on the Timber Sale Program Information Reporting System (TSPIRS) for Fiscal Year 1994 for the Ketchikan Area.

It is important to remember that public investment analysis is based on the assumption that estimated revenues for an alternative will actually occur. To accurately predict PNV's and avoid overstating the level of benefits or revenue associated with each alternative, economic analysis must incorporate risk or the probability that certain events or outcomes will occur. The degree of risk is a function of a historical loss or falldown associated with similar projects. For

example, the estimated biological yield for a fully stocked timber stand reforested following initial harvest may never be realized due to future losses from insects, disease, or shifts in species composition. Adjustment must be made to factor in these risks and falldown. Additionally, the net revenues from harvesting existing timber stand are expected to be less than the returns from future harvests. This conclusion is based on the assumption that a large portion of the costs incurred today will provide infrastructure improvements to support future timber harvests.

Socioeconomic Analysis

As part of a long-term cooperative effort among the Federal government, the State of Alaska, and local municipalities to provide greater economic diversity in Southeast Alaska, the Tongass Timber Management Program was developed. Timber harvested in National Forests is subject to domestic processing requirements. Therefore, most of the jobs provided by the pulp mills and sawmills in the region are linked to timber supplies from the Tongass. Maintaining timber supply opportunities for the region's timber industry was an important objective of both the TTRA and ANILCA. Employment in logging, lumber, and pulp production in Southeast Alaska increased by 30 percent between Fiscal Year 1981 and Fiscal Year 1990 (ANILCA 706(a) Report to Congress, Region 10 USDA Forest Service, 1990).

However, the maintenance of ANILCA's timber employment objectives is dependent on other factors. Interest rates, production and shipping costs, regional competition, private and public harvest levels, foreign exchange rates, and the overall Pacific Rim demand for wood fiber also affect employment levels in the timber industry.

Types of Socioeconomic Effects

Under all project alternatives except for the No Action Alternative, the regional economy will be stimulated as a result of project related expenditures, payroll expenditures, and related indirect and induced spending, or "multiplier effects." In assessing the economic impacts of the project, it is important to recognize that because of methodology, regional economic impacts associated with this project are measured as if they take place in one phase. However, reality dictates that these impacts actually take place along two primary phases. The initial phase of the project is likely to result in a higher level of expenditures, primarily for infrastructure upgrades such as roads. These higher expenditures are likely to result in a temporary increase in the level of local economic activity. However, since these expenditures are by nature short-term, their impact on the regional economy will be limited. Economic activity generated during the second phase of the project, the routine harvesting of designated areas, will continue throughout the life of the project. Therefore, while from a public investment perspective, initial project outlays result in higher Forest Service costs and therefore, a lower PNV, from a socio-economic perspective these additional expenditures may result in a higher infusion of cash into the local economy, creating additional demand and thus creating an increased level of local economic activity.

Long-term economic impacts may further affect the demographic characteristics of the area, with resultant minor impacts on the local housing market and various community services.

Methodology

Multipliers generated by the Forest Service's economic model, IMPLAN, were used to provide estimates of levels of employment and income which would be supported by each of the proposed timber harvest alternatives within the Control Lake Project Area. The economic effect of any alternative is composed of primary or direct effects, and secondary or indirect and induced effects. Direct effects are measured primarily as increases in employment and income within the wood product industry (including harvesting, construction, logging, transportation,

processing, and sawmill operations) resulting from any changes in production levels. This methodology is based on the assumption that any increase in production is in response to an increase in market demand. Indirect and induced effects, here on to be referred to as indirect effects, are an economic by-product of increased expenditures (increased demand) for goods and services on the part of industries directly involved in timber harvesting, as well as the additional wage earners employed in timber harvesting and production. For example, sawmills require electricity, mechanical components, and miscellaneous supplies to meet the demand for lumber. Some of these necessities will be purchased locally. The providers of those services and supplies will, in turn, increase their consumption of goods and services, thus creating additional rounds of expenditures. Further economic stimulus is created when wages from the direct and indirect employment effects are spent within the project region. Multipliers generated by IMPLAN capture all rounds of spending and response generated through increases in industrial and individual consumption.

The IMPLAN model, like other regional economic input-output models, serves as a proxy for the actual economic structure of a region. The foremost assumption of an input-output model, such as IMPLAN, is that the production function of local industries remains constant over time. Therefore, the ratio of employment to output is held constant, allowing for derivation of changes in direct employment based on estimates of changes in total industry output. Due to increased efficiency in the timber industry over the past few years, the share of labor as a production input is less. To represent as realistically as possible all potential economic impacts, the IMPLAN model has been adjusted accordingly. It now incorporates employment and output information that is more representative of current industry structure.

A variety of industries comprise what is commonly referred to as the "wood products industry." For purposes of this analysis, a distinction is made between employment attributed to timber harvest and the employment supported by processing of that timber into lumber, cants, and pulp. This distinction is important in terms of the timing of employment opportunities and the availability of other sources of fiber. For several reasons, the consequences of the proposed action are more directly reflected in the employment figures corresponding to timber harvest activities rather than those of the processing industries. Although the Project Area is one source of supply for the mills, a number of previously mentioned factors influence the amount of pulp and lumber produced, as well as the potential of additional fiber supplies. Finally, employment figures reported here represent a portion of the current work force rather than an absolute increase in employment. Consequently, they are most appropriately used for comparison between alternatives.

Employment and Income Effects

Tables 4-60 and 4-61 list the results derived from the IMPLAN model analysis for each alternative. Employment and income effects for timber harvesting activities are based on the detailed estimates of logging and road construction costs used in the economic efficiency assessment previously discussed. Historical trends were used as determinants in the percentage distribution of stumpage volume to be allocated between pulp and lumber production. This distribution, in turn, affects projected employment and income effects associated with timber processing. Personal income estimates are based on average industry wages as reported by the timber industry and the Alaska Department of Labor.

Table 4-60
Total Employment and Income Effects on Socioeconomics

	Alternative 10		Alternative 11		Alternative 12	
	Employment[1/]	Income[2/]	Employment[1/]	Income[2/]	Employment[1/]	Income[2/]
Timber Harvesting						
Logging	110	$3.79	262	$9.01	315	$10.81
Construction	26	$1.02	97	$3.74	121	$4.65
Marine Transport	2	$0.06	5	$0.15	6	$0.18
Subtotals	138	$4.87	364	$12.90	442	$15.64
Timber Processing						
Sawmills	76	$2.77	189	$6.86	228	$8.27
Subtotals	76	$2.77	189	$6.86	228	$8.27
Totals	214	$7.64	553	$19.76	670	$23.91

Source: Analyses in project planning record.

1/ Employment = Direct Employment (person-years)

2/ Income = Direct Income ($ million)

Table 4-61
Employment Effects and Estimated Return to the State and Ketchikan from Federal Income Taxes Derived from Project-Produced Personal Income

	Alt. 10	Alt. 11	Alt. 12
Employment Effects			
Direct Jobs	214	553	670
Indirect and Induced Jobs	94	242	293
Total Jobs	308	795	963
Total Personal Income	$10,210,000	$26,370,000	$31,920,000
Federal Income Tax	$1,940,000	$5,010,000	$6,060,000
25% Transfer to State from Federal Income Tax (estimated at 5% of total personal income)[1/]	$510,000	$1,320,000	$1,600,000
Payment to Ketchikan (4.5% of total State receipts, estimated)	$23,000	$59,400	$72,000

Source: Analyses in project planning record

1/ This percentage of personal income taxes paid to the federal government has been returned on average to the State. This amount does not include the 25 percent of gross federal receipts returned from the Forest Service to the State of Alaska.

These site-specific data were incorporated into the IMPLAN model to calculate the total effect of increased timber-related output in the construction, logging, sawmill, and pulp mill industries within Southeast Alaska.

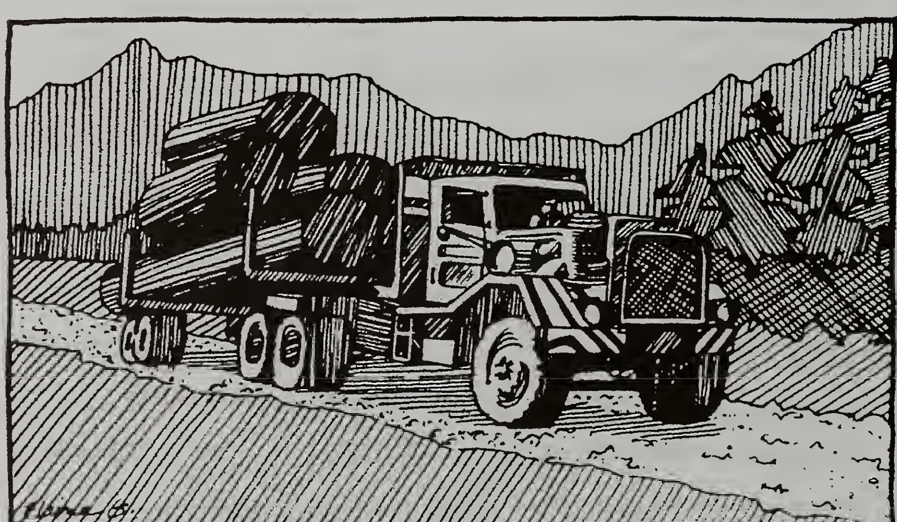
Employment opportunities closely parallel the level of timber harvest. A larger timber harvest is accompanied by greater local expenditures. Therefore, Alternative 12 produces the highest employment effects, since local expenditures associated with its implementation are highest among the alternatives. The annual harvest and annual mill production under Alternative 12 would result in the largest employment gains associated with the harvest. Harvest under the scenarios proposed for Alterative 10 would sustain the lowest level of regional employment relative to Alternative 12. As employment is reduced, regional income and economic output would also fall.

Total direct employment supported under the harvest alternatives has been broken down into two major categories, timber harvesting and timber processing. Overall, timber processing is expected to support slightly higher direct employment than timber harvesting.

Under the assumption that implementation of the No Action Alternative would eliminate the proposed harvest volume within the ROI and of the latter employment opportunities, selection of the No Action Alternative could cause a significant impact to the economic base of communities dependent on timber harvesting on Prince of Wales Island and timber processing at the various sawmills.

Fiscal Effects

To help the public understand timber management, the Forest Service initiated the Timber Sale Program Information Reporting System (TSPIRS), which is intended to improve the way information is developed and displayed. The TSPIRS presents three reports on the National Forest timber program for the year. The three reports are (1) The Financial Report; (2) The Economic Report; and (3) The Employment, Income, and Program Report. The TSPIRS is produced and made available to the public annually.



Although it is not possible to accurately determine timber sale revenues to the Federal government, pond log values net of specified road and logging costs can be used as basis for an approximation. Moreover, it is estimated that 25 percent of gross National Forest receipts go to the State of Alaska and are returned to local areas with distribution based on a percent of the National Forest in an area.

As indicated in Tables 4-61 and 4-62, Alternative 12 is expected to produce the largest receipts to the State of Alaska and the Ketchikan Area while Alternatives 11 and 10 would yield progressively lower receipts. Implementation of the No Action Alternative would result in both negative economic and fiscal impacts. Not only would direct and indirect employment opportunities be eliminated, but tax receipts generated from increased employment would also be eliminated. No new jobs would be created, resulting in the loss of additional tax revenues, and those currently employed in industries directly or indirectly related to timber harvesting and processing could lose their jobs. This would decrease tax receipts and lead to a higher burden on the State for unemployment compensation.

Table 4-62
Estimated Minimal Payments to the State of Alaska

	Alt. 10	Alt. 11	Alt. 12
Total Volume (MBF)	37,733	93,612	113,274
Net Stumpage Value1/ per MBF (High value)	$129.53	$89.69	$86.21
Road Construction Costs (per MBF)2/	$101.49	$149.91	$154.23
Net Stumpage Value + Road Construction Costs (per MBF)	$231.02	$239.60	$240.44
Less $0.50/MBF to Treasury3/	$230.52	$239.10	$239.94
Multiplied by MBF4/	$8,698,211	$22,382,629	$27,178,964
25% to State	$2,174,553	$5,595,657	$6,794,741

Source: Analyses in project planning record.

1/ High value is based on 1st quarter 1995 values and average Forest-wide species composition.
2/ Includes road construction, road reconstruction, and LTF construction costs
3/ $0.50/MBF is the minimum payment to the U.S. Treasury
4/ National Forest Receipts Act payments (25% of net stumpage value plus the value of capital improvements such as purchaser credit for roads, LTF's, and timber stand improvements) to the State of Alaska.

Localized Economic Implications

The predictive capabilities of the IMPLAN model are based on linear relationships. Regardless of the size or direction of change in timber harvest levels, the model assumes that the regional economy is expected to respond in a strictly proportional manner. In reality, this straight-line relationship may not hold, and some industries may be forced to shut down completely if production is significantly reduced. The extensive capital investment in a pulp mill represents a fixed cost that cannot be altered in the short run. To remain economically viable, the plant must

run continuously at a reasonable operating level to cover fixed and variable costs. Conversely, if large increases in demand occur, an industry may expand operations with additional capital investment to purchase more efficient technology. New technology usually requires only a limited increase in employment. So the estimates of employment and income derived from IMPLAN must be interpreted with regard to the scale and operating capacity of industries within the ROI.

The same logic applies to the assessment of economic impacts to the communities of Prince of Wales Island and Ketchikan. Implementation of Alternatives 11 or 12 represent a continuation of ongoing economic activity. Therefore, they would be expected to result in the previously cited economic and fiscal benefits, and not alter ongoing local and regional expenditure patterns. Implementation of the No Action Alternative or Alternative 10 may have adverse economic impacts on the regional economy. Implementation of these alternatives may result in adverse impacts on various communities on Prince of Wales Island, primarily those that provide an alternative source for some goods and services.

Community Stability and Lifestyles

In addition to changes in employment and income, implementation of each of the alternatives will affect other elements of community and individual stability and lifestyles. Elements associated with community and individual stability in this context, reflect the visual and recreational value of the Project Area and surrounding region, wildlife habitat, and subsistence resources. Detailed discussions of the respective impacts on these resources are presented in corresponding sections of this document.

Community stability is a very important consideration in planning for timber harvest activities on the Tongass National Forest. In addition to values described in preceding discussions (e.g., employment, income, tax receipts), a balance between natural and human resource activities is important to the communities of Southeast Alaska. Many of the residents of Southeast Alaska derive their livelihood from the timber industry or benefit from the economic development the timber industry has brought to their communities.

Implementation of the No Action Alternative may result in substantial cutbacks in the industry's production. The corresponding decrease in timber harvesting and processing employment and income would negatively affect community stability.

Implementation of Alternatives 10, 11, or 12 would maintain different levels of timber harvesting through the Control Lake Project implementation period. All alternatives would disperse management activities and tend to bring those areas that have not yet been developed under active timber management within the Project Area.

Sectoral Economic Effects

Commercial Fishing Industry

As noted in the Fisheries and Watershed Resource Report (Rogers and Ablow, 1995), no measurable effects on fisheries resources are expected under the action alternatives because habitat is protected as required to meet the standards and guidelines of the TLMP, TTRA, and NFMA. Therefore, implementation of any of the alternatives would not affect the commercial fishing industry.

Recreation and Tourism Industry

Future employment in the recreation and tourism industries, including employment related to sport hunting and fishing, is projected to change at the same rate as future use. Projected future

recreational use demand in Southeast Alaska during the 1990s is expected to increase by 27 percent for recreation and tourism, 36 percent for sport fishing, and 53 percent for hunting (USDA Forest Service, 1990). Projected future increases in recreation and tourism related employment in Southeast Alaska are expected to correspond to increases in recreation demand. Implementation of Alternatives 10, 11 or 12 is not expected to significantly affect or be affected by this regional trend.

Jobs and earnings related to expenditures made by deer hunters and salmon anglers are widely dispersed across Southeast Alaska. Hunters and anglers use towns within the Economic Region of Influence to replenish their groceries, gasoline and other supplies. However, most expenditures for equipment and initial supplies are made in their home communities. Similarly, the employment and personal income generated by other recreational users of the Control Lake Project Area are dispersed across Southeast Alaska and throughout a variety of economic sectors. These people include individual recreationists, outfitter-guides and their clients, and tourists viewing the Project Area from cruise boats or from the Alaska Marine Highway ferry system.

Gill net commercial fishing

Because of the estimated low relative level of recreational activity that takes place in the Control Lake Project Area, and because the alternatives would not significantly affect many recreation places and sites, no significant impact is expected on employment and income opportunities in the recreation and tourism industry under the No Action Alternative or any of the action alternatives. Implementation of any of the action alternatives may result in the displacement of recreational users to areas outside the Project Area. This displacement would be a result of recreationists seeking specific primitive or semi-primitive recreational opportunities that might no longer be available in the area of active timber harvest or road construction. As more areas are harvested for timber, displaced recreationists seeking primitive or semiprimitive recreational opportunities would find it increasingly difficult to find places to recreate on Prince of Wales Island.

Cumulative Effects

The cumulative effects of each of the alternatives on the economic and social environment are difficult to estimate. A wide variety of factors affect employment and income levels, tax receipts, demographic characteristics, lifestyles, and community stability within the Southeast Alaska region. The cumulative effects associated with the proposed timber harvesting alternatives in the Control Lake Project Area on the reasonably foreseeable and longer-term future of Prince of Wales Island and its surrounding area are expected to take place along two primary aspects.

The first aspect relates to the economic and social benefits of continued harvesting of the proposed volume on Prince of Wales Island. From the standpoint of employment, personal income, population, community services, and some aspects of community stability, there is substantial benefit from maintaining long-term timber harvest in the contract area. The receipts generated, including revenue to the U.S. Treasury, payments to the State of Alaska, State and local taxes, and dollars brought into the community, all represent an economic benefit from continued timber activity.

Based on the timber supply analysis (see *Silviculture, Timber, and Vegetation* section) it is apparent that future timber harvest will shift away from the northern and north-central road system areas of Prince of Wales Island and increase in the south-central road system and isolated areas. In addition, substantial acres are at risk of becoming falldown due to the conversion of soft falldown and changes in land use into hard falldown or long-term changes in the suitable landbase (see timber supply analysis in *Silviculture, Timber and Vegetation* section). If greater falldown occurs, then the effects on the communities of Prince of Wales Island will be greater than the effects associated with the shift in harvest areas.

It is reasonable to assume that with less timber harvest activity within the north-central road system through time, the operators may be expected to travel further between operations than in the past. This additional travel can equate to longer commutes for operations and/or extended periods of time away from home.

The second aspect of a long-term timber harvest that needs to be addressed is the alteration of the natural environment when roads are constructed and timber is harvested (i.e., the impact of locational differences of timber cutting within Prince of Wales Island). Much of the economic and social value of Southeast Alaska is dependent on its natural setting. The recreation and tourism industry is based primarily on the natural setting and visual resources of the region. As National Forest System and other lands are converted from a natural condition to a managed forest, the activities dependent on and the values attributed to the natural state of the forested land, including subsistence, will be adversely affected. Moreover, the intrinsic value of the natural habitat in itself is diminished.

Under falldown scenarios as discussed above, resources that are more dependent on old-growth forest conditions would benefit. Similarly, amenity values related to more natural conditions could benefit. Harvesting that leaves more residual trees (in contrast to clearcutting) will also contribute to a more natural-appearing landscape to the casual forest visitor.

The balance necessary to maintain a viable, robust economic and social environment is established at a National or Regional level, rather than at a project level. Cumulative economic and social effects of the proposed alternative actions in the Control Lake Project Area must ultimately be assessed in context with coinciding local, regional, and national economic and social developments. Based on regional standards and guidelines, the action alternatives have been constructed to minimize the negative cumulative effects on the economics and community values of the core communities when considering the total resource.

Subsistence

Key Terms

Alaska National Interest Lands Conservation Act (ANILCA)—requires evaluations of subsistence impacts before changing the use of certain Federal lands.
Birds—includes ducks (e.g., mallards, widgeons, teals, shovelers, old squaws, golden eyes, and buffleheads), seabirds and seaducks (e.g., scoters, murres, murrelets, puffins, seagulls, and cormorants), Canada geese, seabird eggs, and other birds.
Finfish or fish—includes cod, halibut, flounder, sole, flatfish, rock fish, herring, eulachon, hooligan, Dolly Varden, steelhead, trout, and other fish (excluding salmon).
Invertebrates or shellfish—includes king crab, dungeness crab, tanner crab, shrimp, sea cucumber, sea urchins, abalone, octopus, scallops, gumboot, clams and cockles, other invertebrates, and herring eggs.
Land mammals—includes deer, moose, goat, black bear, wolf, small game, and furbearers (i.e., marten and land otter).
Marine mammals—harbor seal and other marine mammals.
Non-rural—a community with more than 7,000 people; does not qualify for priority use of subsistence resources. Ketchikan and Juneau in Southeast Alaska have been determined to be non-rural by the Federal Subsistence Board.
Plants—includes beach greens, mushrooms, roots, seaweed/kelp, and berries.
Rural—all Southeast Alaska communities other than Juneau and Ketchikan; residents qualify for priority use of subsistence resources.
Salmon—includes chinook (king), sockeye (reds), coho (silver), pink (humpback), and chum (dog).
Subsistence—customary and traditional uses by rural Alaskans of wild renewable resources.
Wildlife Analysis Area (WAA)—a division of land designated by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis.

Introduction

Section 810 of ANILCA (Public Law 96-487) requires a Federal agency having jurisdiction over lands in Alaska to evaluate the potential effects of proposed land use activities on subsistence uses and needs. Section 810 (a) of ANILCA states:

In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the Federal agency having primary jurisdiction over such lands or his designee shall evaluate the effects of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency

1. gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to [ANILCA] Section 805;

2. gives notice of, and holds, a hearing in the vicinity of the area involved; and

3. determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; (B) the proposed

activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such action.

This section evaluates how the proposed action alternatives could affect subsistence resources used by the rural communities in the Control Lake Project Area and vicinity. The subsistence resource categories evaluated are deer, black bear, furbearers, salmon, other finfish, shellfish, other food resources, and firewood.

Evaluation Criteria

Criteria used to evaluate the effects of the proposed alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) changes in access to subsistence resources, and (3) changes in competition from nonsubsistence users for those resources. The evaluation determines whether subsistence opportunities in the Project Area or portions of the Project Area may be significantly restricted by any of the proposed action alternatives. To determine this, the evaluation: (1) considers the availability of subsistence resources in the surrounding areas; (2) considers the cumulative impacts of past, present, and foreseeable future activities on subsistence users and resources; (3) looks at potential cultural and socioeconomic implications affecting subsistence users; and (4) focuses on the mapped subsistence use in the Project Area. The evaluation relies heavily upon the use of wildlife habitat capability models as well as upon ADF&G hunter survey data.

This subsistence evaluation considers, with distinct findings by alternative and by resource category, whether or not there is a significant possibility of a significant restriction of subsistence use. The Alaska Land Use Council's definition of "significant restriction of subsistence use" is one guideline used in the findings. By this definition:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by non-rural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision of Record in *Kunaknana v. Watt* provided additional definitions of "significant restriction of subsistence uses" and are also used as guidelines in the findings. The definitions from *Kunaknana v. Watt* include:

> Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or slight effect as opposed to large or substantial effects. In further explanation the Director (BLM) states that no significant restriction results when there would be "no or slight" reduction in the abundance of harvestable resources and no occasional redistribution of these resources. There would be no effect (slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting site; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by non-rural residents).

Conversely, restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvest-

able access to active subsistence-use sites or major increases in non-rural resident hunting. In light of this definition, the finding of significant restriction must be made on a reasonable basis, because it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle. The Draft EIS evaluates the availability of subsistence resources in surrounding areas that could be accessed without undue risk or economic hardship to subsistence users.

Most of the data in this section are analyzed by WAA, management units delineated by the ADF&G and used by the Forest Service. None of the WAA's are completely located within the Project Area. WAA 1323 is almost entirely within the Project Area; WAA 1319 is about three-fourths in the Project Area; and WAA's 1318 and 1421 are one-half and one-third, respectively.

Habitat capabilities and harvest numbers reported here are based on the entire WAA (including State and private lands), whereas in the *Wildlife* section, they are based only on the portion of the WAA within the Project Area. This section analyzes habitat capability on an entire WAA basis to facilitate comparisons to animal harvest, which are available from ADF&G records on a WAA basis. It is important to note that there are substantial differences between the two sets of habitat capability numbers.

In order to account for increases in harvest demand over time, observed harvest levels are increased for harvest projections based on Alaska State population projections (1991). An average increase of 1.8 percent per year is used through 2010 and 1.5 percent per year is used thereafter.

Direct, Indirect, and Cumulative Impacts on Subsistence Use of Deer

Specific areas within the Control Lake Project Area are more important than others for harvesting subsistence resources. Figures 3-27 through 3-32 depict Control Lake subsistence use areas developed from the TRUCS database (Kruse and Muth 1990). Only rural communities were surveyed by TRUCS; therefore, use of the Project Area by Ketchikan residents is not depicted. The deer harvest maps depict areas where less than 1, 1-5, 5-15, and greater than 15 percent of households in one or more communities have ever harvested deer.

The greatest deer harvest is concentrated along the major road systems of the Project Area. Within the Project Area, the extent and location of the subsistence use area precludes complete avoidance. Areas other than subsistence use areas that could be harvested are limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visuals, or unit and road design. Effort was made to protect the highest value subsistence areas. For example, beach fringe is one of the highest use subsistence areas, and none would be harvested under any of the proposed alternatives.

Abundance and Distribution

Determining what harvest levels are sustainable assumes that habitat capability projections from the deer harvest model reflect an approximation of future deer populations. Although estimated habitat capabilities do not accurately reflect populations, they are the only measure available of the future populations. It also assumes that the distribution of deer harvest across a WAA is approximately proportional to the available habitat. Furthermore, it is based on the determination that the sustainable harvest is 10 percent of the deer population (Flynn and Suring 1989). The analysis assumes that the 1987 to 1991 mean deer harvest reflects rural and non-rural community use of deer in Project Area WAA's. ADF&G has collected deer harvest data for individual WAA's since 1987. Averaging the deer harvest makes allowance for factors that influence deer numbers and hunting activity from year to year, such as weather patterns, access, habitat capability, and hunting success.

Non-rural residents harvested an average of 922 deer or 23 percent of the deer taken from the Project Area WAA's, while rural residents harvested an average of 3,069 deer or 77 percent during 1988 to 1991 (Table 3-42). Based on the assumptions described above, Table 4-63 presents the estimated Project Area deer harvest in 1995 and compares them to habitat capabilities calculated for existing conditions and under the action alternatives. This table indicates that the estimated 1995 habitat capability may be below the level that can sustain the projected 1995 harvest levels on a continuing basis in Project Area WAA's.

WAA Map

Table 4-63

Project Area WAA Deer Harvest in 1995 Compared to Habitat Capability in 1998 by Alternative

	1995 Harvest[1/]			1998 Habitat Capability		
WAA	Rural Residents	All Hunters	1995 Habitat Capability[2/]	Alt. 10	Alt. 11	Alt. 12
1318	353	391	2,721	2,707	2,675	2,671
1319	268	330	2,481	2,456	2,412	2,407
1323	105	139	1,751	1,744	1,708	1,698
1421	115	231	2,765	2,762	2,747	2,747
Total	841	1,091	9,718	9,678	9,542	9,523

SOURCE: Thornton 1992. Data derived from ADF&G Deer harvest Survey Summary Statistics 1987-1991 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1988-91 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value.

After the Control Lake Project timber harvests are completed, estimated habitat capabilities would be lower with the largest decrease associated with Alternative 12 and the smallest decrease tied to Alternative 10. Deer harvest levels in 1995 would be about 11.3 to 11.5 percent of predicted habitat capabilities after Control Lake timber harvests. A deer population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both sustainable and provides a reasonably high level of hunter success relative to effort. At 20 percent, the hunter success rate may decrease and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable.

The habitat capabilities shown in Table 4-63 were estimated using the 1991 version of the deer model. If the 1996 version is used, habitat capabilities would be less and 1995 deer harvest levels would represent a higher percentage of predicted habitat capabilities (see *Wildlife* section). Although the harvest levels (1987-1994 average) and habitat capabilities (1996 deer model) are different in the TLMP FEIS (USDA Forest Service, 1997), the conclusions are the same in that WAA's 1318 and 1319 habitat capabilities may not support harvest levels over the long-term.

Access

Access to traditional subsistence use areas may be affected where logging activities (including road construction) take place near the beach fringe because traditional subsistence access includes use by boat on the beaches in the Elevenmile area. Alternative 10 would not allow harvest or road construction within 5 miles of the beach fringe in the Elevenmile area. Harvest activities under Alternative 11 would occur about 3 miles from the beach; Alternative 12 harvest and road construction would be within 1 mile of the beach in this area. However, all roads in this area would be closed after harvest activities are completed.

New and rebuilt roads would provide access to areas that were not previously used for subsistence harvest of deer. Miles of road proposed for construction and reconstruction are provided in Table 4-59. Table 4-46 shows how many miles of these roads would be closed after construction. New access would be greatest for Alternative 12 and least for Alternatives 10 and 11. Road access would favor harvest by residents who live in communities connected to the road system and use vehicles for hunting or who bring a vehicle to Prince of Wales Island on the ferry. Road access details are presented in the *Transportation and Facilities* section.

Competition

Competition for subsistence resources in the Control Lake Project Area is an issue for residents of Prince of Wales Island. Residents are concerned about competition from residents of Ketchikan, mostly because of the numbers of people that come to Prince of Wales via the ferry. Because Ketchikan residents are considered non-rural, this competition can be regulated if it starts to restrict rural residents' ability to obtain subsistence resources.

Table 3-42 shows the distribution of deer harvest in Project Area WAA's among rural and non-rural communities. Data indicate there is competition with non-rural hunters at least in WAA's 1318 and 1319 because the population needed to support the total harvest exceeds the habitat capability by 33 to 44 percent. Overall, deer habitat capability in all WAA's currently and within the foreseeable future is close to the level needed to sustain rural and non-rural subsistence harvest (Table 4-64).

The Federal Subsistence Board may use its authority to regulate non-rural harvest of deer and has authority to prioritize the harvest of deer among rural residents when necessary to protect the resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability of adequate abundance of deer needed by the rural communities using the Project Area whether or not the proposed actions are implemented.

Individual household use of specific areas may be displaced by some of the proposed actions. There is not sufficient information available to evaluate displacement potential for individual households, nor would it be practical. With one major exception, the Project Area's accessibility makes it very unlikely that an individual household or even an entire community is highly dependent on specific areas within the Project Area that may be affected by proposed alternatives. The exception is the use of the Western Peninsula area by Klawock residents. A long history of subsistence use of this area by Klawock residents using boat access has occurred. Some alternatives may negatively affect this long-term use pattern. The known uses of the Project Area by individual communities are discussed in Chapter 3.

Table 4-64
Project Area WAA Deer Harvest Compared to Habitat Capability Projected through 2054

WAA	Rural Harvest Percentage[1/]	2004 Projected Harvest[2/]	2004 Habitat Capability[3/]	2024 Projected Harvest[2/]	2024 Habitat Capability[3/]	2054 Projected Harvest[2/]	2054 Habitat Capability[3/]
1318	90	459	2,671	630	2,440	985	2,093
1319	81	387	2,407	531	2,207	831	1,908
1323	76	163	1,698	224	1,558	349	1,347
1421	50	271	2,747	371	2,499	580	2,127
Total	77	1,280	9,523	1,756	8,704	2,745	7,475

SOURCE: Thornton 1992. Data derived from ADF&G Deer Harvest Survey Summary Statistics 1987-1991 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.
2/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted harvest levels using 1988-1991 average harvest levels, which are increased by 1.8% per year through 2010 and 1.5% per year thereafter.
3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area, and are reduced for patch size effectiveness. Habitat capabilities for 2004 assume that all units in Alternative 12 have been harvested. Habitat capabilities for 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Control Lake Project Area reductions between 1995 and 2054. Habitat capabilities for 2024 are based on linear interpolation between 2004 and 2054 levels.

The evaluation indicates that deer abundance may be inadequate to both meet subsistence and non-subsistence demand within the area historically used by residents of each community. Any displacement that may occur is likely to be to other areas within a household's or community's historical range. Furthermore, any displacement that may occur would likely be temporary until activities within the Project Area conclude in 3 to 5 years.

Cumulative Effects

Table 4-64 displays the effect of Control Lake Project timber harvesting and other foreseeable harvesting from 1998 through 2004, the assumed reasonably foreseeable future harvest volume (see *Vegetation and Timber Resources* section). Predicted deer harvest levels in 2004 would be about 13.4 percent of predicted habitat capabilities. This conclusion considers all private, State, and encumbered lands in Project Area WAA's.

Cumulative effects of timber harvest from 2004 to 2054 were assessed under the assumption that all suitable-available timber would be harvested by 2054 (see *Wildlife Cumulative Effects* section). Under this scenario, the projected number of deer available for harvest in the year 2054 generally would be significantly below the number needed to meet both subsistence and nonsubsistence demands (Table 4-64). Thus, a restriction in deer hunting may be necessary in the future in order to maintain a sustainable harvest of deer.

Community Analysis

The following sections are organized by community. They draw on four types of data presentations: (1) percent of a community's deer harvest that occurred within the Project Area WAA's; (2) tables showing acreage of subsistence use areas harvested under Project alternatives; and (3) figures comparing the current and projected habitat capability of deer available for harvest in Project Area WAA's with populations needed to support harvest.

The first type of data is the percent of community deer harvest that occurs within the boundaries of the Project Area. This information was presented and discussed in Chapter 3. The second type of data presentation displays the amount of acreage overlapping between proposed cutting units and areas used for subsistence deer hunting by more than 5 or 15 percent of the households in a given community. Tables 4-65 and 4-66 summarize the analysis for each community. The third type of data presentation compares the estimated supply and demand for deer for the Project Area WAA's from which a particular community currently harvests deer.

Table 4-65

Acreage Used by More than 5 Percent of Rural Community Households for Deer Hunting, and Acres Proposed for Timber Harvest by Alternative and Community

Rural Community	Acres Used by >5% of Community Households	Acreage Proposed for Harvest by Alternative			
		1	10	11	12
Coffman Cove	7,206	0	0	72	88
Craig	18,332	0	185	249	301
Hollis	134	0	0	0	0
Hydaburg	6,241	0	94	86	120
Klawock	48,294	0	179	543	847
Thorne Bay	21,001	0	293	480	655
Total[1/]	-	0	751	1,430	2,011

SOURCE: Kruse and Muth, 1990. Derived from TRUCS database using GIS.

1/ Note: Total Acres includes acres that are counted more than once when they are used by more than one community.

Table 4-66

Acreage Used by More than 15 Percent of Rural Community Households for Deer Hunting, and Acres Proposed for Timber Harvest by Alternative and Community

Rural Community	Acres Used by >15% of Community Households	Acreage Proposed for Harvest by Alternative 1	10	11	12
Coffman Cove	0	0	0	0	0
Craig	2,543	0	6	6	6
Hollis	0	0	0	0	0
Hydaburg	0	0	0	0	0
Klawock	15,611	0	77	71	94
Thorne Bay	7,599	0	139	149	191
Total[1/]	-	0	222	226	291

SOURCE: Kruse and Muth, 1990. Derived from TRUCS database using GIS.

1/ Note: Total Acres includes acres that are counted more than once when they are used by more than one community.

Coffman Cove

Thirty-seven percent of Coffman Cove's deer harvest came from Project Area WAA's (1319 and 1421) between 1988 and 1991 (Table 3-42). Table 4-65 shows that the action alternatives would harvest between 0 and 88 acres of land used for deer hunting by at least 5 percent of Coffman Cove households. No land used by 15 percent or more of Coffman Cove households would be harvested (Table 4-66). Based on the amount of the Project Area used by Coffman Cove residents for hunting and the cumulative reductions in habitat capability in the WAA's there is a significant possibility of a significant restriction of the subsistence use of deer by Coffman Cove residents, if non-rural harvesting is not restricted, for all alternatives. This conclusion is supported by the analysis presented in the TLMP FEIS (1997).

Craig

Fifty percent of Craig's deer harvest came from the Project Area WAA's (1318, 1319, 1323, and 1421) between 1988 and 1991 (Table 3-42). Table 4-65 shows that the action alternatives would harvest between 185 and 301 acres of land used for deer hunting by at least 5 percent of the Craig households. Six acres of land used by at least 15 percent of Craig households would be harvested (Table 4-66). Based on the amount of the Project Area used by Craig residents for deer hunting and the cumulative reductions in habitat capability in these WAA's, there is a significant possibility of a significant restriction of the subsistence use of deer by Craig residents if non-rural harvesting is not restricted, for all alternatives. This conclusion is supported by the analysis presented in the TLMP FEIS (1997).

Hollis

Fourteen percent of Hollis' deer harvest came from Project Area WAA's (1381 and 1421) between 1988 and 1991 (Table 3-42). Table 4-65 shows that the action alternatives would not harvest any lands used for deer hunting by 5 percent or more of the Hollis households. Based on the small amount of the Project Area used by Hollis residents for deer hunting and the light harvest in Project Area WAA's used by Hollis residents, the risk of a significant restriction of the subsistence use of deer by Hollis residents associated with this Project is low.

Hydaburg

Eighteen percent of Hydaburg's deer harvest came from Project Area WAA's (1318, 1319, 1323, and 1421) between 1988 and 1991 (Table 3-42). Figure 4-11 shows that there is an inadequate deer habitat capability in Project Area WAA's used by Hydaburg residents to meet the subsistence and sporthunting demand in 1995. Table 4-65 shows that the action alternatives would harvest between 86 and 120 acres of land used for deer hunting by at least 5 percent of Hydaburg households. No land used by at least 15 percent of Hydaburg households would be harvested (Table 4-66). Based on the light harvest by Hydaburg residents in Project Area WAA's and the light total harvest in all WAA's used by Hydaburg residents (Forest Service 1996), the risk of a significant restriction of the subsistence use of deer by Hydaburg residents associated with this Project is low.

Klawock

Sixty-six percent of Klawock's deer harvest came from the Project Area WAA's (1318, 1319, and 1421) between 1988 and 1991 (Table 3-42). Table 4-65 shows that the action alternatives would harvest between 179 and 847 acres of land used for deer hunting by at least 5 percent of Klawock households. Between 71 and 94 acres of land used by at least 15 percent of Klawock households would be harvested (Table 4-66). Based on the large amount of the Project Area used by Klawock residents for deer hunting, there is a significant possibility of a significant restriction of the subsistence use of deer by Klawock residents, if non-rural harvesting is not restricted, for all alternatives. This conclusion is supported by the analysis presented in the TLMP FEIS (1997).

Thorne Bay

Fifty percent of Thorne Bay's deer harvest came from Project Area WAA's (1318, 1319, 1323, and 1421) between 1988 and 1991 (Table 3-42). Table 4-65 shows that the action alternatives would harvest between 293 and 655 acres of land used for deer hunting by at least 5 percent of the Thorne Bay households. Between 139 and 191 acres of land used by at least 15 percent of Thorne Bay households would be harvested (Table 4-66). Based on the amount of the Project Area used by Thorne Bay residents for deer hunting and the cumulative reductions in habitat capability in these WAA's, there is a significant possibility of a significant restriction of the subsistence use of deer by Thorne Bay residents, if non-rural harvesting is not restricted, for all alternatives. This conclusion is supported by the analysis presented in the TLMP FEIS (1997).

Whale Pass

Twenty percent of Whale Pass' deer harvest came from Project Area WAA's (1318, 1319, and 1421) between 1988 and 1991 (Table 3-42). Based on the amount of the Project Area used by Whale Pass residents for deer hunting and the cumulative reductions in habitat capability in these WAA's, there is a significant possibility of a significant restriction of the subsistence use of deer by residents, if non-rural harvesting is not restricted, for all alternatives. This conclusion is supported by the analysis in the TLMP FEIS (1997).

Summary of Findings for Deer

All of the action alternatives would create a significant possibility of a significant restriction of subsistence use of Sitka black-tailed deer by the residents of most local communities after project implementation and through the reasonably foreseeable future if non-rural harvesting is not restricted (Table 4-67). Under-reporting of deer harvest in rural communities might increase the likelihood of non-rural harvest restrictions in the future. Cumulative timber harvest in Project Area WAA's is expected to create a significant possibility of a significant restriction, even with restriction of non-rural harvest, at some point in the future.

Table 4-67
Possibility of a Significant Restriction of Subsistence Use of Sitka Black-Tailed Deer after Project Implementation for each Alternative and Community

	Significant Possibility of Restriction			
Community	Alt. 1	Alt. 10	Alt. 11	Alt. 12
Abundance or Distribution				
Coffman Cove	May	Yes	Yes	Yes
Craig	May	Yes	Yes	Yes
Hollis	No	No	No	No
Hydaburg	No	No	No	No
Klawock	May	Yes	Yes	Yes
Naukati	No	May	May	May
Thorne Bay	May	Yes	Yes	Yes
Whale Pass	May	Yes	Yes	Yes
Access:				
All Communities	No	No	No	May
Competition:				
All Communities	Yes	Yes	Yes	Yes

Note: "No" indicates an insignificant possibility of a significant effect. "Yes" indicates a significant possibility of a significant effect in the future. "May" indicates there may be a significant possibility of a significant effect in the future.

Direct, Indirect, and Cumulative Impacts on Subsistence Use of Other Resources

Abundance and Distribution

Black Bear

Black bear are generally not a major food source (Kruse and Muth, 1990) and the majority of documented harvest from Project Area WAA's (63 percent) are taken by non-resident hunters. A limited number of local hunters take black bears for food, and black bear parts are used for other cultural purposes, as well.

In 1995, black bear habitat capability is 508 versus a harvest of 49 bears (Table 4-68). A black bear population at carrying capacity should be able to support a hunter harvest of approximately 10 percent that is both reasonably sustainable and provides a reasonably high level of hunter success relative to effort. At 20 percent, the hunter success rate may decrease and, if the population is at carrying capacity, 20 percent may approach a rate that is not sustainable. Harvest is about 20 percent of habitat capability in WAA 1318, but is less than 10 percent of habitat capability for all Project Area WAA's combined. Non-Project Area communities harvest the majority of black bears in each of the WAA's, thus providing significant competition to residents of Project Area communities. No significant overall reduction in black bear habitat capability would occur as a result of the Control Lake timber harvesting alternatives.

Table 4-68
Project Area WAA Black Bear Harvest in 1995 Compared to Habitat Capability in 1998 by Alternative

WAA	1995 Harvest[1/] Rural Residents	1995 Harvest[1/] All Hunters	1995 Habitat Capability[2/]	1998 Habitat Alt. 10	1998 Habitat Alt. 11	1998 Habitat Alt. 12
1318	11	35	164	162	162	162
1319	6	10	142	141	140	140
1323	0	1	61	61	58	56
1421	1	3	141	141	141	140
Total	18	49	508	505	501	498

SOURCE: Paul, 1992. Data derived from ADF&G Black Bear Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1987-1991 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using estimated disturbance factors to account for disturbance associated with roads.

Roads left open to vehicle access for bear hunting following timber harvest may increase hunting success. However, the access management plan associated with the action alternatives would result in a net reduction of open roads. No timber harvest is proposed within beach and estuary fringe habitats. Changes in local black bear distribution would occur in the vicinity of ongoing timber harvest activities during the life of the proposed project. Bears tend to move back into these areas after timber harvest is completed. However, declines in local black bear use are expected when the age of the second growth in harvest units reaches about 25 years.

Furbearers

Furbearers are currently being trapped in the Project Area. Tables 4-69 and 4-70 show marten and river otter harvests by Project Area and non-Project Area communities and impacts.

In 1995, marten habitat capability was 490 compared to a harvest of 160 animals, or 33 percent of habitat capacity (see Table 4-69). This suggests that there may already be significant competition for marten within the Project Area, with much of that competition coming from non-rural communities outside of the Project Area. WAA 1318 does not currently appear to provide the habitat capability needed to support projected 1995 harvest levels. The proposed timber harvest for Control Lake would further reduce marten habitat capability by an additional 2 to 9 marten, or less than 1 to 2 percent. Roads left open for public use during trapping season may further decrease marten populations. However, the Project access management plan would result in a net decrease in open roads within the Project Area.

In 1995, overall river otter habitat capability is about 10 percent of the Project Area WAA habitat capability (Table 4-70). Competition between rural and non-rural communities does not appear to be significant. Proposed Control Lake timber harvest alternatives would not alter river otter habitat capability, thus habitat capabilities would continue to meet harvest demand.

Table 4-69

Project Area WAA Marten Harvest in 1995 Compared to Habitat Capability in 1998 by Alternative

WAA	1995 Harvest[1/] All Hunters	1995 Habitat Capability[2/]	1998 Habitat Alt. 10	Alt. 11	Alt. 12
1318	72	108	107	106	105
1319	65	153	152	150	149
1323	0	63	63	62	62
1421	23	166	166	165	165
Total	160	490	488	483	481

SOURCE: Paul, 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992, and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using 1988-1991 harvest levels, which are increased 1.8% per year. Rural harvest represents about 86 percent of total harvest.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value. Numbers in parentheses represent habitat capability after being reduced by the Road Density Index and underestimate habitat capability in some WAA's.

Table 4-70

Project Area WAA River Otter Harvest in 1995 Compared to Habitat Capability in 1998 by Alternative

WAA	1995 Harvest[1/] All Hunters	1995 Habitat Capability[2/]	1998 Habitat Alt. 10	Alt. 11	Alt. 12
1318	8	33	33	33	33
1319	5	38	38	38	38
1323	0	46	46	46	46
1421	4	47	47	47	47
Total	17	164	164	164	164

SOURCE: Paul, 1992. Data derived from ADF&G River Otter Harvest Survey Summary Statistics 1988-1992.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1987-1991 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area.

Salmon

Salmon are a major subsistence food harvested in the Control Lake Project Area. The *Watersheds and Fisheries* section concludes that potential effects of the proposed timber harvest and road construction alternatives on salmon spawning and rearing habitat would be minimal or eliminated by applying the Forest Service standards, guidelines, and prescriptions described in detail in the Aquatic Habitat Management Handbook (USDA Forest Service, 1986b) and Soil and Water Conservation Handbook (USDA Forest Service, 1991b). All salmon spawning and

rearing streams (Class I and Class II streams) near proposed timber harvest units are protected by buffers of at least 100 feet as prescribed in the TTRA. In addition, specific prescriptions for protecting salmon habitat were incorporated during the design of harvest and roads.

Based on the implementation of site-specific prescriptions for protecting salmon spawning and rearing habitat, the immediate and foreseeable effects on the abundance and distribution of salmon for subsistence uses in the Project Area would not be measurable.

Other Finfish

The action alternatives for the proposed project would have no immediate or foreseeable effect on other finfish habitat. Because there would be no effect on other finfish habitat, the abundance and distribution of those other finfish would not be affected.

Shellfish

Based on the limited impact that existing LTF sites have on marine and estuarine habitat, crabs, and benthic organisms, the effect of this project on the abundance and distribution of local crabs, clams, and other shellfish would not be measurable for purposes of subsistence. No new LTF's would be developed under any of the action alternatives. The project would not have any additional impacts on shellfish for the foreseeable future.

The Western Peninsula area of WAA 1323 is perceived, especially by Klawock residents, as a cultural resource, as much as or more than an area of natural resources. This perception is embedded in the complex of subsistence activities that are conducted there, and the wide range of subsistence resources collected and harvested in that area, including shellfish. None of the action alternatives would negatively affect the cultural experience associated with shellfish harvest in this area.

Other Food Resources

Other foods include plants such as kelp, goose tongue, and a variety of berries. Most traditional gathering of these foods occurs near beach and estuarine areas. None of the alternatives infringe upon beach areas potentially used for other food gathering. Road construction activities would improve access to berry picking sites that are now not reasonably accessible, in the short-term, but open road miles would decrease over the long-term.

Because beach fringe and estuaries would not be significantly affected by the proposed timber harvest, the Project's activities and foreseeable impacts are not expected to substantially affect the abundance and distribution of other foods.

Firewood/Personal Use Wood

The Forest Service has a free-use policy (with limits) for firewood and timber and none of the proposed alternatives would have an adverse effect on the availability of firewood, personal-use timber, and traditional uses of wood, such as for totem poles.

Access

Access to traditional subsistence use areas may be affected where logging activities are located along existing roads or near the beach fringe. This is because traditional subsistence access is by motorized vehicle or by boat to the beaches of the Project Area (Ellanna and Sherrod, 1987). The effect on access would probably be minor under Alternatives 10 and 11 because harvest activities would be about 3 miles from the beach in the Elevenmile area and no marine and estuarine habitat would be affected by logging activities. Under Alternative 12, harvest activity would occur within 1 mile of the beach in this area, increasing the likelihood of conflicts.

New and rebuilt roads would provide motorized vehicle access to areas that were not previously used for subsistence harvesting resources (see alternative maps, separate map packet, for details). Miles of road proposed for construction are shown in Table 4-59. Road access would favor harvest by residents who live in communities connected to the road system or who bring a vehicle to Prince of Wales Island on the ferry. Road closures and other management prescriptions developed for Project Area roads take subsistence uses into consideration.

Competition

Competition for subsistence resources in the Control Lake Project Area is an issue to residents of Prince of Wales Island. Residents are concerned with competition from residents of Ketchikan, mostly because of the numbers of people that come to the island via the ferry. Subsistence resources most likely to be affected by competition from Ketchikan residents include deer, bear, and marten. Because Ketchikan residents are considered non-rural, this competition could be regulated if it starts to restrict non-rural residents' ability to obtain subsistence resources.

There is no evidence to indicate that availability of salmon, finfish, shellfish, or other food resources to subsistence users would be affected by sport or non-rural harvest. Any increase in competition from non-rural residents and Alaska nonresidents would not be substantial because of the availability of resources in the immediate vicinity and in the surrounding areas.

Individual household use of specific areas may be displaced by some of the proposed actions. There is not sufficient information available nor would it be practical to evaluate displacement potential for individual households. With one major exception, the Project Area's accessibility makes it very unlikely that an individual household or even an entire community is highly dependent on specific areas within the Project Area that may be affected by proposed actions. Generally, there are sufficient lands available elsewhere within or outside the Project Area and within the home range of the communities for subsistence gathering. The exception is the use of the Western Peninsula area by Klawock residents. A long history of subsistence use of this area by Klawock residents using boat access has occurred. The action alternatives are not expected to negatively affect this long-term use pattern. The known uses of the Project Area by individual communities are discussed earlier in this section.

Cumulative Effects

Harvesting levels for the reasonably foreseeable future (to 2004) generally would not significantly alter the habitat capability from 1995 for black bear, marten, and river otter when compared to the impacts of the Control Lake Project (1998). Project Area habitat capability would be less than 10 times black bear harvest levels due to an imbalance in WAA 1318 (Table 4-71). Project Area habitat capability would be about 2.5 times marten harvest level (Table 4-72). River otter habitat capabilities are not predicted to decline from 1995 levels. In summary, by the year 2004 there is a significant possibility of a significant restriction in the availability of marten for subsistence use particularly in WAA's 1318 and 1319. Restricting non-rural harvests of these resources in the WAA's showing reduced habitat capability may be required to avoid subsistence restrictions.

Based on projected future timber harvest associated with TLMP (1997) approximately 367 acres per year would be harvested in the Project Area from 2005 through 2054 (see Table 4-33). The *Wildlife* section projects that this level of harvest would affect the habitat capability of most wildlife species. The changes in habitat capability could affect their abundance and distribution. Relative to habitat capability estimated for 1995, the potential black bear habitat capability is projected to decrease cumulatively by 31 percent (Table 4-71), the potential marten

habitat capability by the year 2054 is projected to decrease cumulatively by 21 percent (Table 4-72); the potential river otter habitat capability is projected to decrease cumulatively by 0 percent.

Table 4-71
Project Area WAA Black Bear Harvest Compared to Habitat Capability Projected through 2054

	Rural	2004		2024		2054	
WAA	Harvest Percentage[1/]	Projected Harvest[2/]	Habitat Capability[3/]	Projected Harvest[2/]	Habitat Capability[3/]	Projected Harvest[2/]	Habitat Capability[3/]
1318	34	41	162	56	143	88	114
1319	67	12	140	16	124	25	99
1323	0	1	56	2	50	3	42
1421	50	3	140	4	123	6	98
Total	41	57	498	78	440	122	353

SOURCE: Paul, 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1991 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.
2/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted harvest levels using 1987-1991 average harvest levels, increased by 1.8% per year through 2010 and 1.5% per year thereafter.
3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and are reduced for road disturbance. Habitat capabilities for 2004 assume that all units in the unit pool have been harvested. Habitat capabilities for 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Control Lake Project Area reductions between 1995 and 2054. Habitat capabilities for 2024 are based on linear interpolation between 2004 and 2054 levels.

Summary Findings for Other Resources

The above analysis leads to the conclusion that the actions proposed in Alternatives 10, 11 and 12, would not produce a significant possibility of a significant restriction on subsistence use of river otter, salmon, other finfish, or other resources. However, a significant possibility of a significant restriction is predicted for black bear and possibly for marten, under all alternatives, if non-rural harvesting is not restricted. This finding is based on the potential resource effects on three evaluation categories: abundance or distribution, access, and competition (Table 4-73). Cumulative timber harvest in Project Area WAA's is expected to create a significant possibility of a significant restriction on subsistence use of black bears and martens, even with restriction of non-rural harvest, at some point in the future.

Other Conclusions

Section 810 (a) (3) of ANILCA (P.L. 96-487, 1980) requires that when a significant restriction may occur, determinations must be made in regard to whether:

1. Such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;
2. The proposed activity will involve the minimum amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and
3. Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

The following section outlines the other subsistence conclusions.

Table 4-72
Project Area WAA Marten Harvest Compared to Habitat Capability Projected through 2054

	2004		2024		2054	
WAA	Projected Harvest	Habitat Capability[3/]	Projected Harvest	Habitat Capability[3/]	Projected Harvest	Habitat Capability[3/]
1318	85	105	116	97	182	85
1319	76	149	104	137	162	120
1323	0	62	0	57	0	50
1421	27	165	37	158	58	131
Total	188	481	257	449	402	386

SOURCE: Paul, 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.

2/ Estimates are based on the entire WAA, including portions outside the Project Area and are based on predicted harvest levels using 1988-1991 average harvest levels, which are increased by 1.8% per year through 2010 and 1.5% per year thereafter. Rural harvest represents about 86 percent of total harvest.

3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and are reduced for patch size effectiveness. Habitat capabilities for 2004 assume that all units in the unit pool have been harvested. Habitat capabilities for 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Control Lake Project Area reductions between 1995 and 2054. Habitat capabilities for 2024 are based on linear interpolation between 2004 and 2054 levels.

Table 4-73
Possibility of a Significant Restriction of Subsistence Use of Other Resources after Project Implementation for All Alternatives

	Marten	River Otter	Black Bear	Fish/ Shellfish	Others
Abundance or Disturbance	May	No	Yes	No	No
Access	No	No	No	No	No
Competition	May	No	Yes	No	No

Note: "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect. "May" indicates there may be a significant possibility of a substantial effect in the future.

Necessary, Consistent with Sound Management of Public Lands

The alternatives have been examined to determine whether they are necessary, consistent with sound management of public lands. In this regard the NFMA of 1976, ANILCA, the Alaska Regional Guide, the TLMP, the TLMP Revision (1997), the Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program have been considered.

The ANILCA emphasized the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make available for harvest 4.5 billion board feet of timber per decade from the Tongass National Forest and left the KPC contract in place. The TTRA removed the 4.5 billion board feet requirement from ANILCA but directed the Forest Service to seek to meet market demand and the market demand for the planning cycle, and left the volume requirements and contract area of the KPC contract in place.

The alternatives presented here encompass four different approaches that would produce the resources that would best meet the purpose and need of this project. All of the alternatives involve some potential to affect subsistence uses. Among the action alternatives, Alternative 10 would produce the lowest effects on subsistence and Alternative 12 would produce the highest. All of the action alternatives appear to be necessary and consistent with sound management of public lands due to the level of impact on subsistence use and wildlife habitat.

Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action

Appendix A addresses the availability of other lands suitable for timber harvest. Much of the Tongass National Forest is used for deer hunting by one or more rural communities for subsistence purposes. The areas of most subsistence use are the areas adjacent to existing road systems, beaches, and areas in proximity to communities. Within the Project Area, the extent and location of the subsistence use area precludes complete avoidance. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visuals, or unit and road design. Effort was taken to protect the highest value subsistence areas. For example, beach fringe is one of the highest use subsistence areas and none will be harvested under any of the proposed alternatives.

The impact of viable timber harvest projects always includes alteration of old-growth habitat, which in turn always reduces projected habitat capability for old-growth-associated subsistence species. It is not possible to lessen harvest in one area and concentrate it in another without affecting one or more rural communities' important subsistence use areas.

Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources

Reasonable steps to minimize impacts on subsistence have been incorporated in development of the alternatives and project design criteria. Project design criteria called for locating roads and units outside of important subsistence use areas such as beach fringe, estuary fringe, and riparian areas adjacent to salmon streams. Road access details, which would protect subsistence resources, are presented in the *Transportation and Facilities* section.

During development of alternatives, an effort was made to minimize activities that could adversely affect important subsistence use areas. Units were selected to avoid to the greatest extent possible areas with high subsistence use characteristics, such as along roads, rivers and creeks, and beach fringes. In addition to generally avoiding these areas, harvest units were minimized or deferred in many geographic areas with high wildlife and subsistence values (see Landscape zone descriptions and effects analysis in Chapter 2).

EIS Conclusions

The ROD for the Control Lake Project will include a final determination about the significant restriction on subsistence use that may result from implementation of the selected alternative. In summary, the potential foreseeable effects from the action alternatives in the Control Lake Project Area do not present a significant possibility of a significant restriction of subsistence uses of river otter, marine mammals, waterfowl, salmon, other finfish, shellfish, and other foods. However, a significant possibility of a significant restriction does exist for deer, marten, and black bear.

Cultural Resources

Key Terms

Cultural resources—all evidence of past human-related activity. It may be historic, prehistoric, architectural, or archived in nature. Cultural resources are nonrenewable aspects of our national heritage.
Sensitivity zone—defined as "high," "medium," or "low," based on the probability that they might contain cultural resources.
SHPO—State Historic Preservation Officer.

Introduction

Documentation of cultural resources, with preservation and protection of National Register eligible resources are general Forest Service objectives for such undertakings as the current Project. Where avoidance and *in situ* preservation are not viable management options, then measures are implemented to recover data as a way of mitigating effects to significant cultural resource properties.

Direct and Indirect Effects

Direct impacts to cultural resources may result from activities such as road building, logging or construction of log transfer facilities. While natural processes, such as erosion and redeposition, can also adversely effect cultural resources, such processes can be accelerated as a result of logging-related activities. Indirect impacts to resources, such as increased access to an area or change in stream flow or sediment loads, may result from logging or road building. Additionally, increased access to an area containing significant cultural resources due to trail development can result in direct and indirect effects and will be addressed through additional compliance survey.

Intensive cultural resource inventory of areas that have a high probability of containing cultural resources is an important means of protecting these resources. The current project initially focused inventory in proposed cutting units and along proposed roads in high probability areas. No new cultural resource properties were located during the intensive inventory of about 1,140 acres inventoried in or adjacent to harvest units or road corridors. As inventory of the proposed harvest units and roads neared completion, 720 acres were surveyed along rivers and around lakes in the Thorne River/Hatchery Creek scenic/recreational area. No cultural resource properties were located in this area.

An additional 1,350 acres of Forest Service administered and State of Alaska lands were surveyed in a continuous swath along or near the shoreline from Point Swift on Nossuk Bay in the north to the boundary with Native Corporation lands in the south. Inventory along the coast resulted in relocation and evaluation of 13 known properties and the location and evaluation of 28 previously unrecorded properties. In addition, many Culturally Modified Trees (CMTs) were located, none of which are considered significant resources warranting avoidance or further data collection.

During the Control Lake EIS Project cultural resources inventory, cultural resource personnel intensively surveyed approximately 3,210 acres, while approximately 335 acres were reviewed at the reconnaissance level by field personnel. While none of the properties has been specifically identified as a traditional cultural/religious location, reported use of the area by Tlingit people from Klawock and Craig may include currently undocumented traditional cultural practices.

The following statements summarize presumed effects on known, significant cultural resource properties of logging and road construction being considered as part of the various alternatives. This data is also summarized in Table 4-74.

Table 4-74
Number of Known Cultural Resource Properties Potentially Affected by Alternative

	Alternative			
Cultural Resource Properties Impacts	**1**	**10**	**11**	**12**
Direct Impacts	0	0	0	0
Risk of Indirect Impacts	0	0	0	0

Alternative 1

No action taken will result in no effect to cultural resources.

Alternatives 10, 11, and 12

No actions will occur at or close to known cultural resource sites. Several properties recommended as eligible for listing in the National Register that could be affected by the proposed project are located on the west coast of Prince of Wales Island, more than 1 mile from proposed harvest units. Given the distance of the properties from harvest units and the current standards and guidelines, development is expected to result in no impact.

The preferred management approach for cultural resource properties by the Forest Service and other agencies is avoidance. Logging operators should be urged to avoid any increase of human activity in the coastal area. To address avoidance and preservation concerns, Forest Service personnel should monitor the area during logging activities. If disturbance occurs or is imminent, then the Forest Archaeologist will develop a plan to protect properties or mitigate the effects of any impacts.

In the unlikely event that avoidance is not feasible or practicable during project implementation, mitigation of impacts to the properties through data recovery plans will need to be undertaken. Data recovery plans will be based on the qualities that make the properties eligible for the National Register.

In cases where development is planned in areas of high cultural resource site probability or in the vicinity of known cultural resources, the Forest Service should develop and implement a plan for monitoring known, significant resources and monitoring for previously unknown properties. If the monitoring program documents effects to properties then measures should be developed to mitigate those effects and if new properties are exposed, they should be recorded and evaluated for National Register eligibility.

Cumulative Effects

Impacts from natural decay, landscape changes, private developments, and timber management activities collectively result in the loss of nonrenewable cultural resources in Southeast Alaska. Development activities of all kinds pose particular threats to cultural resources because such activities tend to be located in the same places that cultural resources are found, such as sheltered coastal settings.

It is impossible to determine the exact nature of resources that may have been previously disturbed in the Control Lake Project Area. Intensive cultural resource investigations and mitigation measures have been implemented only since the 1980s. The implementation of updated research and survey designs based upon the results of previous work and current methods and techniques, combined with various mitigation measures will preserve significant properties and provide data that will guide future research and management activities. In addition, current management approaches for Beach Fringe/Estuary and Riparian Protection (1997 TLMP Revision) should also benefit cultural resources through decreased activity in high probability areas and reduced indirect effects such as sedimentation of resources.

This page left intentionally blank.

Visual

Key Terms

Background—the distant part of a landscape; the seen, or viewed area located from 3 to 5 miles to infinity from the viewer.

Character type—an area of land that has common distinguishing visual characteristics of landform, rock formations, water forms and vegetative patterns.

Characteristic landscape—usually a small portion of a character type that visually represents the basic vegetative patterns, landforms, rock formations and water forms which are in view.

Cumulative visual disturbance—the percent of a viewshed's seen area in a disturbed condition at any point in time.

Distance zone—divisions of a viewed landscape by foreground, middleground, and background zones.

Foreground—portion of viewed area from immediately adjacent to the viewing position to about a half mile from the observer's position; individual branches of trees are discernible.

Maximum Modification—a visual quality objective (VQO) which prescribes that an area may be dominated by management activities, but resulting visual characteristics should appear as a natural occurrence when viewed from the background distance zone.

Middleground—the visible terrain beyond the foreground from about 1/4 mile to 3 to 5 miles from the observer's position; individual trees are still visible but do not stand out distinctly from the landscape.

Modification—a VQO in which management activities may visually dominate the original characteristic landscape, but resulting visual characteristics must resemble natural occurrences within the surrounding area when viewed from the foreground and middleground distance zone.

Not seen—a mapping category associated with distance zones. Sensitivity Level 3 travel routes, use areas, and areas not seen or seldom seen from Visual Priority Routes and Use Areas have been mapped as Not Seen in the visual inventory. Also referred to as "Seldom Seen."

Partial Retention—a VQO in which management activities are to remain visually subordinate to the natural landscape.

Preservation—a VQO which permits ecological changes only; applies to wilderness areas and other special classified areas.

Retention—a visual quality objective which provides for management activities that are not visually evident to the casual observer.

Sensitivity level—a three-level measure of people's concern for the scenic quality of an area.

Unacceptable Modification—does not meet a VQO of Maximum Modification. Excessive modification due to management activities in which the design, size, extent, or duration are poorly related to the scale of landform and vegetative patterns in the characteristic landscape may result in unacceptable modification.

Variety class—classification of the landscape by the diversity and scenic quality of the natural landscape. The three classes are: Class A - Distinctive; Class B - Common; Class C - Minimal.

Viewshed—a defined landscape or panoramic vista seen from one or more specific viewpoints.

Visual Absorption Capacity (VAC)—an estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.

Visual priority routes and use areas—the designated priority routes and use areas from which the proposed VQO's will be applied. Nonpriority travel routes and use areas, and those areas not seen from the Visual Priority Routes and Use Areas, are managed according to "Not Seen" criteria.

Visual Quality Objective (VQO)—management standards reflecting five degrees of acceptable alteration of the natural landscape based on a landscape's diversity of natural features and the public's concern for scenic quality.

Introduction

Timber harvest activities have the potential to change the form, line, color, and texture of the natural landscape. In this section the potential visual contrasts created by proposed harvest alternatives are related to the affected environment that was described in Chapter 3. Effects are analyzed for each Priority Travel Route and Use Area. The ability of proposed units to meet adopted VQO's and potential changes in visual condition are discussed for each of these viewsheds.

The extent of visual contrast created by timber harvest is influenced by unit design, silvicultural prescription, harvest method, and the transportation system. Manipulation and monitoring of these factors as described in this section, helped to mitigate visual contrast. One such mitigation measure is "patch cutting." This technique of visual screening was applied to several units of high visual concern.

Effects of Alternatives

The following discussion evaluates the visual effects of Alternatives 10, 11, and 12 on Priority Travel Route and Use Areas. Viewsheds for each priority area affected by the alternatives are graphically depicted in Figure 3-39. Because no harvest activity is proposed within their viewsheds, there would be no measurable visual effects on the following Priority Travel Routes and Use Areas:

- Communities of Craig and Klawock
- Cutthroat Lakes
- Thorne River Bridge
- Gravelly Creek Day Use Area
- Community of Thorne Bay

Located more than 5 miles west of the Control Lake Project Area is the Maurelle Island Wilderness Area. Appearing as a background element, texture is virtually nonexistent in visible portions of this continuously forested landscape. Atmospheric attenuation further obscures the detection of texture and color. While several harvest units are located in areas visible from the Maurelle Islands, they are not expected to be apparent to the casual forest visitor.

One or more alternatives contain harvest units and associated roadways that would affect visual resources, as seen from the following Priority Travel Routes and Use Areas:

- West Coast Waterway
- Waters around Craig and Klawock
- Control Lake Cabin Site
- Eagle's Nest Campground (Balls Lake)
- Thorne River/Honker Divide Canoe Route
- Forest Highway #9

The effects of Alternatives 10, 11, and 12 on Visual Priority Travel Route and Use Area viewsheds are summarized in Table 4-75 and described in detail below. Unless otherwise noted, the units described below are to be clearcut, with all merchantable timber removed via roads. Proposed harvest methods are described and graphically displayed (Figures 3-10 through 3-18) in the *Vegetation and Timber Resources* section of this document.

Table 4-75
Summary of Proposed Harvest Units Located Within Priority Travel Route and Use Area Viewsheds

Viewshed	VCU	Unit	Alternatives 10	11	12	LUD[1/]	Zone	VQO[3/]	EVC	Note
West Coast	591	407		+	+	TP	MG	MM	1	Helicopter
Waterway		409		+	+	TP	MG	MM	1	
	593	410		+	+	TP	MG	MM	1	
		420			+	TP	MG	MM	1	
		421			+	TP	MG	MM	1	
		431		+	+	TP	MG	MM	1	Group Selection
	594	409		+	+	TP	BG	MM	1	
		416		+	+	TP	BG	MM	1	
		417		+	+	TP	BG	MM	1	Group Selection
		418		+	+	TP	BG	MM	1	Helicopter
		420	+	+	+	TP	BG	MM	1	
Waters Around	594	405		+	+	ML	MG	M	1	
Craig and Klawock	595	402		+	+	SV	MG	PR	1	Group Selection
		406	+	+	+	TP	MG	MM	1	
		411		+	+	ML	MG	M	1	
		434		+	+	SV	MG	PR	1	
Control Lake	595	409	+	+	+	SV	MG	PR	1	
Cabin Site	596	406		+	+	SV	MG	PR	1	Group Selection
Eagle's Nest	596	406		+	+	SV	MG	PR	1	Group Selection
Campground		407		+	+	SV	MG	PR	1	Group Selection
Thorne River/Honker Divide	575	420		+	+	SV	MG	PR	1	Group Selection
		424		+	+	SV	MG	PR	1	Group Selection
Canoe Route		425		+	+	SV	MG	PR	1	Group Selection
Forest Highway #9	595	407	+	+	+	SV	FG	PR	5	ML LUD Intent.
		408	+	+	+	ML	MG	M	1	
		409	+	+	+	SV	MG	PR	1	
		414	+	+	+	ML	MG	M	5	
		419	+	+	+	ML	MG	M	5	
	596	406		+	+	SV	MG	PR	1	Group Selection
		407		+	+	SV	MG	PR	1	Group Selection
		409		+	+	ML	MG	M	1	
	597.1	401	+			ML/OG	FG	PR/R	1	Inconsistent w/ VQO
		410		+	+	ML	FG	PR	1	Inconsistent w/ VQO
	597.2	421		+	+	ML	MG	M	5	
		422	+	+	+	ML	FG	PR	1	Inconsistent w/ VQO
		424			+	ML	FG	PR	1	
		425			+	ML	FG	PR	1	
		458	+	+	+	ML	MG	M	1	

Source: Bedross, 1997
1/ TP = Timber Production; SV = Scenic Viewshed; ML = Modified Landscape.
2/ FG = Foreground; MG = Middleground; BG = Background.
3/ R = Retention; PR = Partial Retention; M = Modification; MM = Maximum Modification.

West Coast Waterway

Alternative 10

One unit (594-420) would be harvested within the West Coast Waterway Viewshed. Harvest of this 91-acre unit would comply with the adopted Maximum Modification VQO and would change the visual condition in its vicinity from natural (EVC 1) to moderately altered (FVC 4).

Alternative 11

Nine units would be harvested within the viewshed. Units 591-407 and 409 would be visible as middleground landscape elements in the vicinity of Salt Lake Bay and Nossuk Bay. Unmerchantable timber and snags would be left throughout clearcut unit 591-407 and the timber yarded by helicopter. Both units are less than 10 acres in size and easily comply with the adopted Maximum Modification VQO. In fact, the casual forest visitor would likely not detect these activities. The area associated with these units would be changed from natural (EVC 1) to natural appearing (EVC 2).

Units 593-410 (27.1 acres) and 431 (22.9 acres) would be seen in the middleground by boaters in the San Christoval Channel, as would the road leading to 593-431. This activity would comply with the adopted Maximum Modification VQO, while changing the visual condition from natural (EVC 1) to slightly altered (FVC 3).

Lastly, five units would be visually apparent as background landscape elements from the San Christoval Channel. Ranging between 43 and 91 acres in size, units 594-409, 416, 417, 418, and 420 would meet the adopted Maximum Modification VQO and change the visual condition in their vicinity from natural (EVC 1) to moderately altered (FVC 4). The southern one-half of 594-409 and all of 594-417 would be harvested by group-selection, leaving large quantities of natural color and texture. Unit 594-418 would be clearcut, but unmerchantable timber and snags left standing.

Alternative 12

This Alternative would harvest eleven units within the West Coast Waterway viewshed. Units 591-407 and 409 would be visible in the middleground from Salt Lake Bay and Nossuk Bay. Unmerchantable timber and snags would be left throughout clearcut unit 591-407 and the timber yarded by helicopter. Both units are less than 10 acres in size and easily comply with the adopted Maximum Modification VQO. The area associated with these units would be changed from natural (EVC 1) to natural appearing (EVC 2). The casual forest visitor would likely not detect these activities.

Units 593-410, 420, 421, and 431 would be seen in the middleground by boaters in the San Christoval Channel, as would the road leading to 593-431. These units range in size from 27 to nearly 61 acres. The adopted Maximum Modification VQO would be achieved and the visual condition changed from natural (EVC 1) to heavily altered (FVC 5).

Finally, five units would be seen in the background from the San Christoval Channel. Ranging between 43 and 91 acres in size, units 594-409, 416, 417, 418, and 420 would meet the adopted Maximum Modification VQO and change the visual condition from natural (EVC 1) to moderately altered (FVC 4). The southern one-half of 594-409 and all of 594-417 would be harvested by group-selection, leaving large quantities of natural color and texture. Unit 594-418 would be clearcut, but unmerchantable timber and snags left standing.

Waters Around Craig and Klawock

Alternative 10

This Alternative includes harvest of unit 595-406 (31.2 acres), which would be seen in the middleground distance zone to boaters using Shinaku Inlet, Klawock Inlet, and Big Salt Lake. This activity would comply with the Maximum Modification VQO and would change the visual condition in its vicinity from natural (EVC 1) to moderately altered (FVC 4).

Alternatives 11 and 12

Five units (594-405; 595-402, 406, 411, and 434) and connecting roadways would appear as middleground elements in the landscape north of Big Salt Lake. Unit 595-402 (61 acres in overall size) would contain a series of group selection cuts that are helicopter yarded, allowing it to meet its adopted Partial Retention VQO and changing the visual condition from natural (EVC 1) to slightly altered (FVC 3) (Figure 4-6). Residual vegetation throughout unit 595-402 would screen many of the harvested "patches" from the casual Forest visitor. Leave-tree islands in 595-434 (nearly 22 acres in overall size) would keep this unit subordinate to the natural landscape and allow it to meet the adopted Partial Retention VQO. Units 594-405 and 595-411, each of which are about 32 acres in size, would achieve the adopted Modification VQO by appearing as undulating horizontal strips that mimic the landform on which they are situated. Harvesting 594-405 and 595-411 would change the associated visual condition from natural (EVC 1) to moderately altered (FVC 4). Unit 595-406 (about 31 acres in size) would easily achieve the adopted Maximum Modification VQO and change the visual condition in its vicinity from natural (EVC 1) to slightly altered (FVC 3).

Control Lake Cabin Site

Alternative 10

The uppermost portion of one unit (595-409), which is about 28 acres in overall size, would be visible in the middleground to people looking south from the cabin at Control Lake. Intervening vegetation would screen the bottom of this unit. This unit would comply with the adopted Partial Retention VQO and change the visual condition from natural (EVC 1) to slightly altered (FVC 3) (Figure 4-7).

Alternatives 11 and 12

Two units would be harvested in areas seen from the Forest Service cabin and adjacent lake surface. The uppermost portion of unit 595-409 (about 28 acres in overall size) would be visible to persons looking south from the cabin. The lower portion of this unit would be screened. This unit would meet the adopted Partial Retention VQO and change the visual condition from natural (EVC 1) to slightly altered (FVC 3).

Unit 596-406 would be located on a middleground ridge visible from the lake's surface and south shore. Uneven-aged management and helicopter yarding in the seen area would minimize color and texture contrast with the surrounding landscape and allow the adopted Partial Retention VQO to be achieved. Most of the harvested "patches" would be screened by residual vegetation. About 55 acres in overall size, this unit is also within the Eagle's Nest Campground (Balls Lake) Viewshed. As a result of harvesting unit 596-406, the visual condition would change from natural (EVC 1) to natural appearing (FVC 2).

Eagle's Nest Campground (Balls Lake)

Alternative 10

This alternative would have no direct visual effect on the Eagle's Nest Campground (Balls Lake) Viewshed. The visual condition in the area would remain largely natural (FVC 1).

Figure 4-6
View North From South Shore of Big Salt Lake

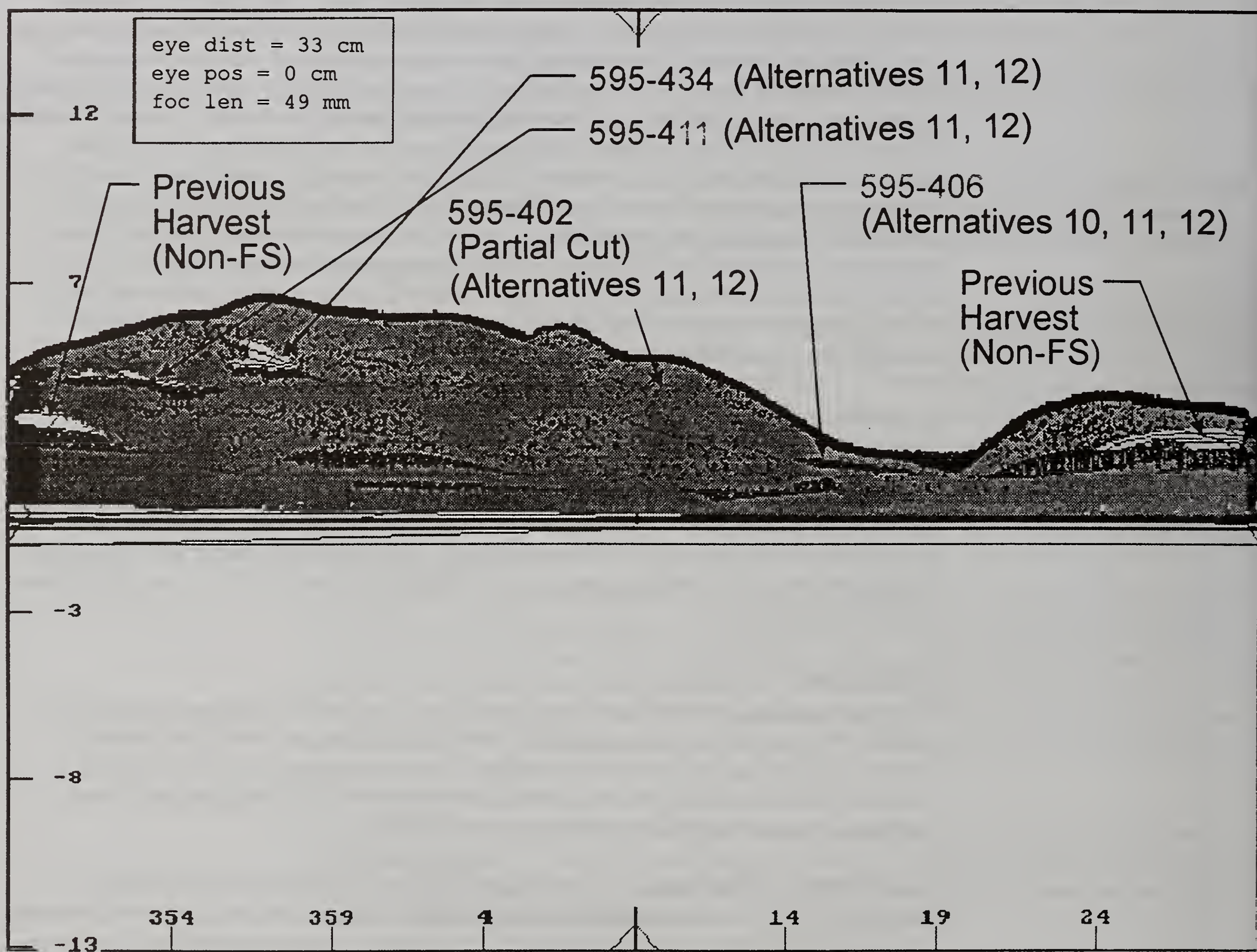
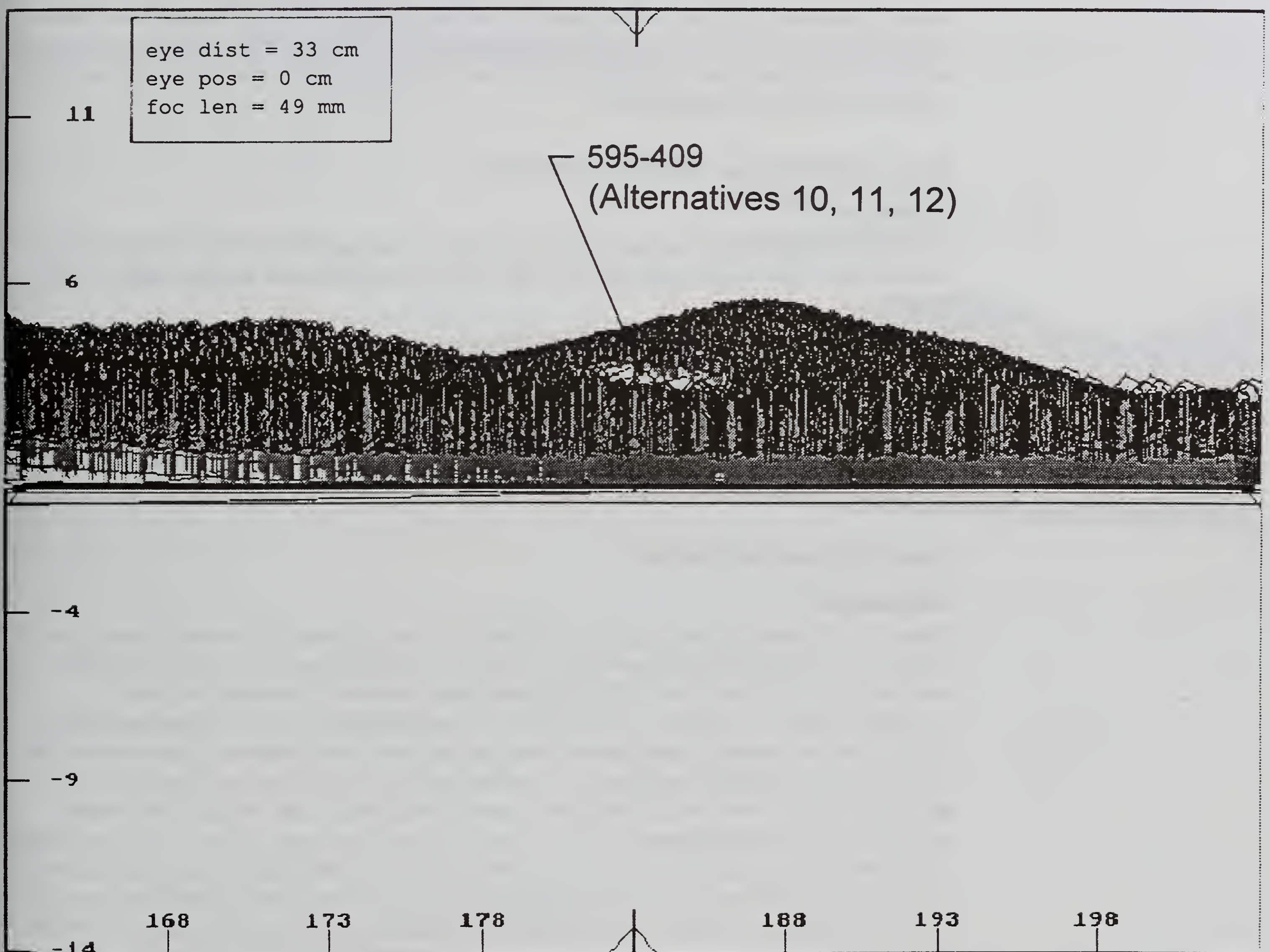


Figure 4-7
View South From Control Lake Cabin



Alternatives 11 and 12

Two units would be harvested within the viewshed. Unit 596-406, which is about 55 acres in overall size, would be located on a middleground ridge west of the Balls Lake (Figure 4-8). This area is visible from the campground, boardwalk, and lake surface. The same area is visible from the water surface and south shore of Control Lake. Group selection cutting and helicopter yarding would allow 596-406 to achieve the adopted Partial Retention VQO and change the visual condition for natural (EVC 1) to natural appearing (FVC 2). Most of the harvested “patches” would be screened by residual vegetation.

About 23 acres in overall size, unit 596-407 would be located in the middleground just south of unit 596-406. Proposed uneven-aged management and helicopter yarding would ensure that the adopted Partial Retention VQO is achieved. This natural (EVC 1) area would be converted into one that is natural appearing (FVC 2).

Thorne River/Honker Divide Canoe Route

Alternative 10

No units proposed by this alternative would be visible from the Thorne River/Honker Divide Canoe Route. The visual condition within the viewshed would remain predominately natural (FVC 1).

Alternatives 11 and 12

Three units (575-420, 424, and 425) would be harvested east of Twin Lake in the middleground distance zone. All of these units would be partial-cuts and none are expected to be apparent to the casual Forest visitor. As a result, they would easily achieve the adopted Partial Retention VQO, while changing the visual condition from natural (EVC 1) to natural appearing (FVC 2).

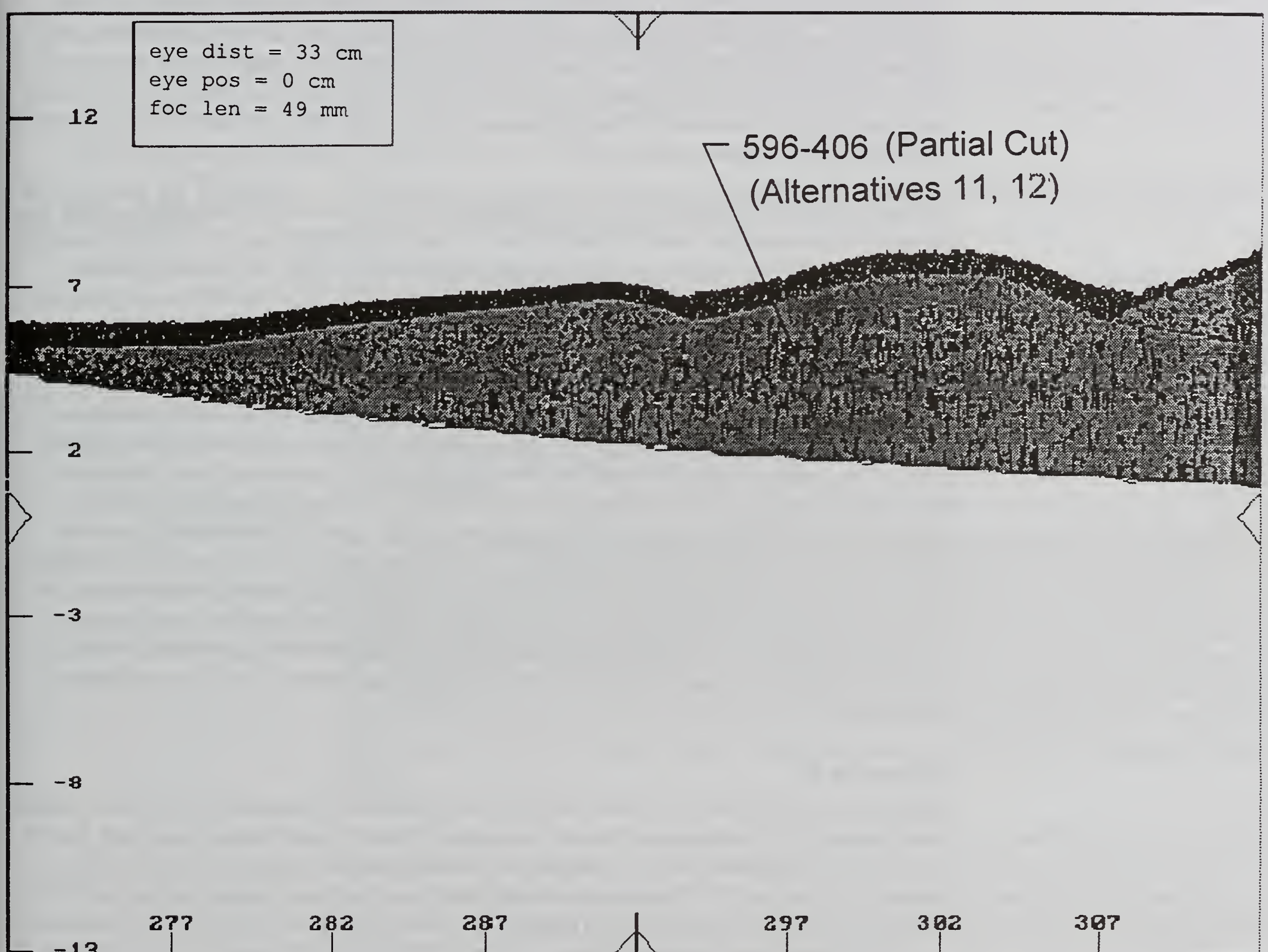
Forest Highway #9 Corridor

Alternative 10

Alternative 10 would harvest eight units within the Forest Highway #9 viewshed, three of which would be in the foreground distance zone. Unit 595-407 would be visible in the foreground south and west of Control Lake. The LUD associated with this 26-acre unit is Scenic Viewshed, based on potential views from Control Lake and Eagle’s Nest Campground (Balls Lake). However, suitable timber harvest lands visible from Forest Highway #9 are intended for inclusion in the Modified Landscape LUD, unless they are also visible from other key viewer locations. Unit 595-407, which would not be seen from Control Lake or Balls Lake, would meet the intended Partial Retention VQO. The visual condition in the vicinity of this unit would remain heavily altered (FVC 5). Unit 597.1-401 would be partially visible east of Balls Lake in the foreground. The western portion of this 43.8-acre unit is in the Old Growth Retention LUD and is inconsistent with 1997 TLMP Standards and Guidelines. Intervening vegetation, which would screen part of 597.1-401, and the application of visual mitigation measures would allow this unit to meet the adopted Partial Retention VQO. The visual condition associated with 597.1-401 would change from natural (EVC 1) to slightly altered (FVC 3). Also visible near the Thorne River would be 597.2-422, which is 22.4 acres in size. This visually dominant unit would not achieve the adopted Partial Retention VQO as currently designed. If harvested, the natural visual condition (EVC 1) in the vicinity of 597.2-422 would be changed to moderately altered (FVC 4).

Five units (595-408, 409, 414, 419, and 597.2-458), which are between 22 and 45 acres in size, would be harvested from the middleground of the Forest Highway #9 viewshed. Located south and west of Control Lake, units 595-408, 414, and 419 would meet the adopted Modification VQO. Unit 597.2-458, which is located south and east of Balls Lake, would meet the adopted Modification VQO. Unit 595-409, which is also visible from Control Lake, would achieve the

Figure 4-8
View Northwest From East Shore of Balls Lake



adopted Partial Retention VQO. The visual condition associated with 595-408, 596-409, and 597.2-458 would change from natural (EVC 1) to moderately altered (FVC 4). The area associated with 595-409 would change from natural (EVC 1) to slightly altered (FVC 3). The visual condition in the vicinity of units 595-414 and 419 would remain heavily altered (FVC 5).

Alternative 11

Twelve units would be harvested within the Forest Highway #9 viewshed. Units 595-407, 597.1-410, and 597.2-422 would be visible in the foreground. Unit 595-407, which is 26 acres in size, would be seen south and west of Control Lake. As described in detail for Alternative 10, it would achieve the adopted Partial Retention VQO and leave the heavily altered visual condition unchanged (FVC 5). Unit 597.1-410 would be visible along the highway near the Thorne River. Although portions of its 28.8 acres are screened by intervening vegetation, this unit would be slightly too large and visually dominant to meet the adopted Partial Retention VQO. Also located near the Thorne River, 597.2-422 (22.4 acres in size) would be too visually dominant to achieve the adopted Partial Retention VQO. Both 597.1-407 and 597.2-422 would change the natural visual condition (EVC 1) in their vicinity to moderately altered (FVC 4).

Nine units would be harvested within the middleground distance zone. Four of these would be harvested to the south and west of Control Lake. Units 595-408 (22.1 acres), 414 (45.4 acres), and 419 (34.4 acres) would all meet the adopted Modification VQO. The visual condition would change from natural (EVC 1) to moderately altered (FVC 4) if 595-408 were harvested. The area surrounding 595-414 and 419 would remain heavily altered (FVC 5) even if these units were harvested. Unit 595-409, which is also seen from Control Lake, would meet the adopted Partial Retention VQO. It would change a natural area (EVC 1) to slightly altered (FVC 3). Three units (596-406, 407, and 409) would be harvested in the middleground near Control Lake and Balls Lake. Units 596-406 and 407 are 54.6 and 22.5 acres in size, respectively. They would be partial cut and helicopter yarded, meet the adopted Partial Retention VQO, and change the visual condition from natural (EVC 1) to natural appearing (FVC 2). Unit 596-409 (28.5 acres) would meet the adopted Modification VQO and change a natural (EVC 1) area to moderately altered (FVC 4). Finally, two units (597.2-421 and 458) would be harvested in the middleground, east of Balls Lake. Unit 597.2-421, which is 45.6 acres in size, would meet the adopted Modification VQO. The associated visual condition would remain heavily altered (FVC 5). Unit 597.2-458 (40.2 acres) would also meet the adopted Modification VQO. This unit would change the visual condition from natural (EVC 1) to moderately altered (FVC 4).

Alternative 12

Alternative 12 would harvest 14 units in the Forest Highway # 9 viewshed, five of which would be located within the foreground distance zone. Unit 595-407 would be seen south and west of Control Lake. This 26-acre unit would achieve the intended Partial Retention VQO, as described in Alternative 10. The heavily altered visual condition would remain unchanged (FVC 5). Unit 597.1-410, located along the highway near the Thorne River and partially screened by intervening vegetation, would be slightly too large (28.8 acres) and visually dominant to meet the adopted Partial Retention VQO. Units 597.2-422, 424, and 425 would also be located in the foreground, east of Balls Lake. At 22.4 acres, unit 597.2-422 would be slightly too large and visually dominant to meet the adopted Partial Retention VQO. It would change the visual condition from natural (EVC 1) to moderately altered (FVC 4). Units 597.2-424 (15.9 acres) and 425 (17.2 acres) would meet their adopted Partial Retention VQO, while converting natural areas (EVC 1) to slightly altered (FVC 3).

Nine units would be harvested in the middleground of the Forest Highway #9 viewshed. Located south and west of Control Lake, 595-408, 409, 414, and 419 would be between 22.1

and 45.4 acres in size. Unit 595-408 would meet the adopted Modification VQO and change the visual condition form natural (EVC 1) to moderately altered (FVC 4). Unit 595-409, which is also seen from Control Lake, would meet the adopted Partial Retention VQO and change the visual condition from natural (EVC 1) to slightly altered (FVC 3). Both 595-414 and 419 would meet the adopted Modification VQO and leave the heavily altered visual condition in their vicinity unchanged (FVC 5). Three units (596-406, 407, and 409) would be harvested in the middleground near Control Lake and Balls Lake. Unit 596-406 (54.6 acres in overall size) and 407 (22.5 acres) would be partial cut, helicopter yarded, meet the adopted Partial Retention VQO, and change the visual condition from natural (EVC 1) to natural appearing (FVC 2). Unit 596-409, which is 28.5 acres in size, would meet the adopted Modification VQO and change the visual condition from natural (EVC 1) to moderately altered (FVC 4). Lastly, 597.2-421 and 458 would be harvested in the middleground, east of Balls Lake. Unit 597.2-421 (45.6 acres) would meet the adopted Modification VQO, while leaving the heavily altered visual condition unchanged (FVC 5). Unit 597.2-458 (40.2 acres) would also meet the adopted Modification VQO, but would change the visual condition from natural (EVC 1) to moderately altered (FVC 4).

Summary of Effects by Alternative

The following discussion summarizes the effects of Alternatives 10, 11, and 12 on the visual resources of the Control Lake Project Area.

Nine units proposed within Visual Priority Travel Routes and Use Areas are common to Alternatives 10, 11, and 12. These units include 594-420 and 595-406, which would seen from the West Coast Waterway and Waters around Craig and Klawock, respectively, in the middleground. Unit 595-409 would be harvested from the Control Lake Cabin Site Viewshed and Forest Highway #9 viewshed in the middleground. Two units (595-407 and 597.2-422) would be visible from Forest Highway #9 in the foreground. Lastly, five units (595-408, 409, 414, 419, 597.2-422, and 597.2-458) would be visible from Forest Highway #9 in the middleground.

As shown in Table 4-76, Alternative 12 would harvest more units (33) within Priority Travel Route and Use Area viewsheds than would Alternatives 10 (10 units) or 11 (29 units). No Alternative 10 units would be harvested in the Eagle's Nest Campground or Thorne River/ Honker Divide Canoe Route viewshed, but none would be visible to the casual forest visitor in any of the alternatives. Alternative 10 would harvest only one unit in each of the following viewsheds: West Coast Waterway, Waters around Craig and Klawock, and Control lake Cabin Site. All 10 of the Alternative 10 units would be visible to the casual Forest visitor. Alternatives 11 and 12 contain 19 and 23 units, respectively, that would be visible to the casual Forest visitor.

Three units would be located in more than one Priority Travel Route and Use Area viewshed. Unit 596-406 (Alternatives 11 and 12) would be situated in the middleground distance zone portion of the Control Lake Cabin Site, Eagle's Nest Campground, and Forest Highway #9 viewshed. As discussed previously, a group selection prescription and helicopter yarding would minimize the visual impact of this unit. Unit 596-407 (Alternatives 11 and 12) would be situated in the middleground distance zone portion of the Eagle's Nest Campground and Forest Highway #9 viewshed. A group selection prescription and helicopter yarding would also minimize impacts associated with this unit. Finally, unit 595-409 (Alternatives 10, 11, and 12) would be apparent in the middleground portion of the Control Lake Cabin Site and Forest Highway #9 viewshed.

Cumulative Visual Effects

Cumulative effects are the results of collective past, present, and reasonably foreseeable future actions. These effects include timber harvest, roads, landings, and contrasts created by slash and second growth. Cumulative effects also include harvest activities on adjacent non-National Forest System lands. These effects are dynamic and, in general, would diminish over time.

Table 4-76
Summary of Visual Effects by Viewshed

	Number of Units Within Viewshed Boundaries			Number of Units Visible to Casual Forest Visitor		
Viewshed	Alt. 10	Alt. 11	Alt. 12	Alt. 10	Alt. 11	Alt. 12
West Coast Waterway	1	9	11	1	7	9
Waters Around Craig and Klawock	1	5	5	1	5	5
Control Lake Cabin Site	1	2	2	1	1	1
Eagle's Nest Campground	0	2	2	0	0	0
Thorne River/Honker Divide Canoe Route	0	3	3	0	0	0
Forest Highway #9	8	12	14	8	10	12
Total	10 1/	29 2/	33 2/	10 1/	19 2/	23 2/

Source: Bedross, 1997

1/ Unit 595-409 is within both Control Lake Cabin Site and Eagle's Nest Campground viewshed.

2/ Unit 595-409 is within both Control Lake Cabin Site and Eagle's Nest Campground viewshed. Unit 595-406 is within Control Lake, Eagle's Nest, and Forest Highway #9 viewshed. Unit 595-407 is within Eagle's Nest and Forest Highway #9 viewshed.

The potential for timber harvest visually dominating the viewshed is greatest immediately following the activities. In the foreground (up to 1/2 mile from the viewer), stumps and debris are dominant. Activities such as cut-and-fill slopes, rock pits, and turnouts would be easily seen within several key viewsheds. As viewed in the middleground (1/2 mile to 4 miles), vivid distinction in texture, line and color between the mature forest and the harvest unit would be apparent. Exposed trunks and limbs of the new edges would dominate the visual setting.

By the fifth year of regeneration, the new forest would be filling out with low-lying vegetation (berry bushes, ferns, etc.). In some cases on poor and disturbed mineral soils, young red alder (low elevations) or Sitka alder (high elevation) would be present. In the foreground, the visual effects of the clearcut would be evident, but the shrubby vegetation and young trees would begin to cover over the stumps and exposed ground. In the middleground, the harvest unit would remain evident, with sharp contrasts in color and texture.

From year 5 to 20, the young trees would become established, reaching a height of approximately 15 feet. Views created with the original clearcut would become limited. In the middleground, the contrasts between the new forest and mature forest would still be obvious.

At the end of 50 years, the new forest would reach 50 to 60 feet. As seen in the middleground, this stand would be approximately half the height of the adjacent mature forest, providing a smoother transition at the harvest unit boundaries. During this time, the canopy would be closing and the new forest would appear very dense. As a general rule, large harvested areas on steep slopes would appear "near natural" to a casual forest visitor at the end of 50 years. However, smaller units on gentler slopes would appear "near natural" somewhat sooner.

Toward the end of 80 years, the stand would reach 75 percent of its mature height. From the middleground, there would be less distinction between this stand and the adjacent mature forest and the canopy would appear full.

At 100 years, little visual difference would be noticed between this 100-foot forest and an adjacent mature forest. It would appear healthy, lush, and with a full canopy. In the middleground, color and texture of the new forest would allow distinction between it and adjacent over mature forests, which display a scattering of dead tops and generally more irregular tree-growth patterns.

Assuming a continuation of the present harvest level (three to five entries per 100 years) and implementation of resource constraints in accordance with the 1997 TLMP through the year 2140, timber harvest would continue to occur in the Control Lake Project Area. During this time, the Forest would be in a state of obvious change towards meeting the Desired Future Condition, which emphasizes landscapes with a mixture of near natural, modified, and highly modified appearances. Following is a description of the anticipated visual condition within each of the six Priority Travel Route and Use Area viewsheds substantially impacted by the Control Lake Project.

West Coast Waterway

Assuming that the lands around Salt Lake Bay remain in the National Forest System, they would remain essentially unmodified. All suitable activities would be integrated in such a way that they remain subordinate to the characteristic landscape. If the State of Alaska selects the land around Salt Lake Bay, however, the associated docks, homes roads, and other facilities would likely contrast sharply with the characteristic landscape.

Views from Nossuk Bay and the remainder of the waterway would contain signs of logging. While various even and uneven-aged silvicultural methods could be employed, clearcutting would likely be used to create a mosaic of harvested and unharvested vegetation. Management activities would remain subordinate to the natural landscape in much of the seen area. Harvest activities would dominate the characteristic landscape in small portions of the viewshed, but would respect natural form, line, color, and texture.

Waters Around Craig and Klawock

Lands adjacent to San Alberto Bay, Shinaku Inlet, and Big Salt Lake in the foreground and middleground are privately owned and have been extensively logged. As the second-growth matures, these areas would likely be harvested again, keeping them in a continually disturbed condition. National Forest System lands, which are visible in the middleground north of Big Salt Lake, would combine areas where harvest activities are dominant with areas where harvest activities are subordinate to the characteristic landscape. Logging on National Forest System lands during the next entry period would be limited by Cumulative Visual Disturbance (CVD) concerns.

Control Lake Cabin Site

If lands within the viewshed remain a part of the National Forest System, management activities would not be apparent in the foreground and would be subordinate to the characteristic landscape in the middleground and background. However, the State of Alaska intends to select this area for commercial and recreation development. Such facilities would likely contrast sharply with the characteristic landscape.

Eagle's Nest Campground (Balls Lake)

Management activities would not be apparent in foreground areas seen from the campground and lake. Lands in the middleground would contain small, irregularly shaped openings that mimic natural patterns. These openings would be unnoticed by the casual Forest visitor or subordinate to the characteristic landscape.

Forest Highway #9

Lands nearest to Klawock are privately owned and have been extensively logged. As the second growth matures, these areas would likely be harvested again, keeping them continually disturbed. National Forest System lands visible south of the Control Lake junction vary from natural to heavily altered in appearance. Proposed harvest would be subordinate to the natural landscape or, at a minimum, borrow from natural form, line, color, and texture.

If lands surrounding Control Lake remain a part of the National Forest System, harvest would be subordinate to the natural landscape. If this area is developed by the state, strong visual contrasts with the natural landscape are likely.

East of Balls Lake, the Forest Highway #9 viewshed is largely natural in appearance. Much of the seen area would remain natural following implementation of this Project. Harvest activity visible in the foreground would be subordinate to the natural landscape (with the exception of units 597.1-410 and 597.2-422). Middleground harvest would resemble natural occurrences.

Thorne River/Honker Divide Canoe Route Mitigation

Limited timber harvest would occur within this viewshed. It would not be apparent to the casual Forest visitor from the river, shore, or associated recreation facilities. Small group-selection cuts and helicopter yarding would likely be required.

Mitigation

Within the confines of the 1997 TLMP goals, objectives, standards, and guidelines, the protection of visual resources was given a high priority during the planning and design of the Control Lake Project unit pool. Use of various strategies (described below) had the effect of mitigating potential visual effects in priority travel route and use area viewsheds. In addition, measures proposed to protect recreation, wildlife, water quality, and other resources also benefitted visual quality within the Control Lake Project Area. Residual snags, leave tree islands, and stream buffers provide structure in harvest units, helping to reduce contrast with the surrounding natural landscape. The aforementioned mitigation measures are detailed in the appropriate resource sections of this document.

During Project planning, efforts were made to minimize visual impacts. Because openings are rarely found in the uniformly forested landscapes that form much of the Control Lake Project Area, it is difficult to meet the Retention VQO using clearcut management techniques. That is, any large created openings would be evident to the casual forest visitor. Therefore, alternative harvest techniques were proposed where the Retention VQO, and in certain instances the Partial Retention VQO, has been adopted. Small group-selection cuts have been prescribed for numerous units potentially visible from Lower Cutthroat Lake, Balls Lake, and the Thorne River. Units treated in this manner include:. 574-427, 575-420, 422, 425, 428, 576-431, 578-402, 595-402, and 596-407. These group-selection cuts were developed in strips parallel to the slope so that the intervening unharvested strips will screen the harvested strips from view. Buffers of vegetation are expected to screen these "patch cuts" from view. Assumptions made in design of "patch cuts" included minimal blowdown in residual buffer vegetation, accuracy of tree stand data (height, crown ratio, density), a finite number of viewpoints, and the accuracy of USGS topographic information. Where less restrictive VQO's have been adopted, seedtree cuts, overstory removals, and shelterwood prescriptions were utilized, in part, to help protect the visual resource.

Where the Modification VQO has been adopted, rectilinear unit boundaries and other obvious man-made patterns in the landscape were avoided. This was performed for units seen in the foreground from the West Coast Waterway and in the middleground from Control Lake and Balls Lake.

Efforts to minimize the visual impacts created by logging roads and landings were also made during Project planning. When feasible in areas of Partial Retention and Modification VQO's, roads and landings were relocated to minimize or eliminate their visibility. More stringent measures were required within the Thorne River/Honker Divide Canoe Route viewshed to ensure that the Retention VQO would be attained. Here, the percent side slope and screening ability of residual vegetation must be considered. The size of cuts and fills will be minimized by fitting the road closely with the terrain, and by using a road surface of minimal width. If these measures fail to hide the road or landing from view (and no other feasible options exist), the surfaces are to be scarified and planted immediately after timber harvest. Roadways with potential visibility from the Thorne River/Honker Divide include those associated with units 574-441, 574-442, and 575-433.

Units 597.1-410 and 597.2-422 would be visible in the foreground distance zone, as seen from Forest Highway #9. These units, located east of Balls Lake, would not comply with adopted VQO's. Unit boundaries and/or silvicultural prescriptions require modification, if these units are to comply with 1997 TLMP Standards and Guidelines.

Aerial view of Nossuk Bay looking north

Monitoring

To ensure the success of the aforementioned mitigation measures, representatives of the Thorne Bay Ranger District should be involved in the final design of units and facilities, and should monitor the layout and cutting of units described herein. A visual resource monitoring program will accomplish the following objectives:

1. Determine if the desired visual character stated in the Proposed Forest Plan is evolving as planned.
2. Provide a means of assessing whether prescriptions set to meet adopted VQO's are successful in producing the intended visual quality and determine the need for and desired revisions and amendments.
3. Determine the need for rehabilitation if VQO's have not been met or evaluate current development and rehabilitation practices for efficiency and improvement.

Oversight by Forest Service visual resource personnel is essential prior to release and during harvest of key units with group-selection cut prescriptions. These units and associated roads are located north of Balls Lake and throughout the Thorne River/Honker Divide. Prior to field implementation, visual resource specialists with an intimate knowledge of the areas involved will review the appropriate unit cards. More detailed field investigations will be conducted to evaluate blowdown potential, refine harvest boundaries, and modify silvilcultural prescriptions.

Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas

Key Terms

Recreation Opportunity Spectrum (ROS)—a system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs.
Recreation place—an identified geographic area having one or more physical characteristics that are particularly attractive to people engaging in recreation activities; can contain from zero to several recreation sites.
Recreation site—specific location or site where recreational activities occur and/or a recreational facility is located. A recreation site is smaller in area than a recreation place.
Recreation Visitor Day (RVD)—a measure of recreation use of an area. One recreation visitor day consists of recreation use of a site or area by one person for 12 hours can be abbreviated "visitor day."
Roadless area—an area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.
Wild and Scenic River—rivers or sections of rivers designated by congressional action under the 1968 Wild and Scenic Rivers Act or by an act of the Legislature of the state or states through which they flow.
Wilderness—areas designated by congressional action under the 1964 Wilderness Act or by TTRA and/or ANILCA; undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation.

Introduction

Timber management activities can change the characteristics of areas where recreation occurs, and thus have an effect on ROS settings, recreation sites, and recreational activities. Harvest activities generally affect the visual character of ROS settings and recreation sites. As a result, there are often changes to both ROS settings and the type of recreational experiences available at recreation sites. In addition to visual changes, harvest activities frequently require new roads, making previously inaccessible, nonroaded areas accessible to motor vehicles. When an area becomes accessible to vehicles, other changes often occur, including changes to the ROS settings and to the types and quality of recreational experiences that occur in an area or at a site.

The TLMP recreation standards and guidelines acknowledge that timber management activities can affect recreation settings, but emphasizes the importance of adapting recreational opportunities as changes occur (USDA Forest Service, 1991). The recreation standards and guidelines state "where scheduled activities change the recreation setting, [an agency should] manage the new setting in accordance with the appropriate ROS guidelines. [An agency should] maintain the capability of all land use designations to provide appropriate quality recreation opportunities on a sustained basis."

Impacts on ROS Settings

All of the alternatives would change existing ROS settings in the Project Area (Table 4-77). Harvest activities associated with the various alternatives would convert varying amounts of nonroaded ROS settings (P and SPNM) to roaded settings (RM and RN). The amount of nonroaded ROS settings in the Project Area would be reduced with all alternatives (the ROS setting of P would be eliminated in all alternatives), and the amount of roaded ROS settings would be increased.

Table 4-77
Changes in Project Area ROS Settings By Alternative

ROS Setting	Existing	Alt. 10	Alt. 11	Alt. 12
P	11,678	11,678	11,678	8,196
SPNM	97,838	90,832	70,330	65,199
SPM	5,678	5,560	5,680	5,680
RN	6,383	5,252	5,334	5,754
RM	49,492	57,747	78,049	86,242
Total	171,070	171,070	171,070	171,070

Harvest activities would reduce the acreage that could potentially support nonroaded recreation and increase the acreage that could potentially support roaded recreation. Alternative 12 would contain approximately 65,199 acres of SPNM and 8,196 acres of P, which is the least amount of both ROS settings among the alternatives. Alternative 10 would contain approximately 90,832 acres of SPNM and 11,678 acres of P, which is the greatest amount of both ROS setting of any of the action alternatives.

The alternatives would have somewhat different effects on the distribution of various ROS settings throughout the Project Area. Figures 4-9 through 4-12 depict where various ROS settings would occur throughout the Project Area for each alternative. As depicted in these figures, ROS settings of SPNM, SPM, and RN would be located throughout the Project Area between ROS settings of RM. All of the alternatives would leave unharvested, contiguous corridors of SPNM of varying widths and acreage along the Thorne River/Hatchery Creek waterway.

The following sections discuss the changes in existing ROS classification settings that would occur with each alternative.

Alternative 10

Alternative 10 would convert the least amount of P and SPNM of any of the alternatives. With Alternative 10, 11,678 acres of P surrounding Lake Galea would remain intact. Approximately 90,832 acres of the existing 97,838 acres of SPNM would remain. Significant areas of SPNM that would remain include all of the SPNM area in the Western Peninsula, an area on both sides of the Thorne River/Hatchery Creek waterway, an area that surrounds the area of P around Lake Galea, and an area around Rio Roberts Creek (Figure 4-9).

With Alternative 10, the amount of acreage classified as RM would increase approximately 8,255 acres to 57,747 acres, and would comprise approximately 34 percent of the Project Area.

Alternative 11

Alternative 11 would have the same effect on the P setting around Lake Galea as Alternative 10. It would convert approximately 27,508 acres of SPNM to other ROS settings. Alternative 11 would convert SPNM areas to RM along the northwestern and northeastern portions of the Project Area, in the area near Shinaku Lakes, and in the eastern portion of the Western Peninsula. Large blocks of SPNM would remain along the Thorne River/Hatchery Creek waterway, the upper portion of Rio Roberts Creek, and much of the Western Peninsula.

Figure 4-9
Alternative 10 ROS Settings

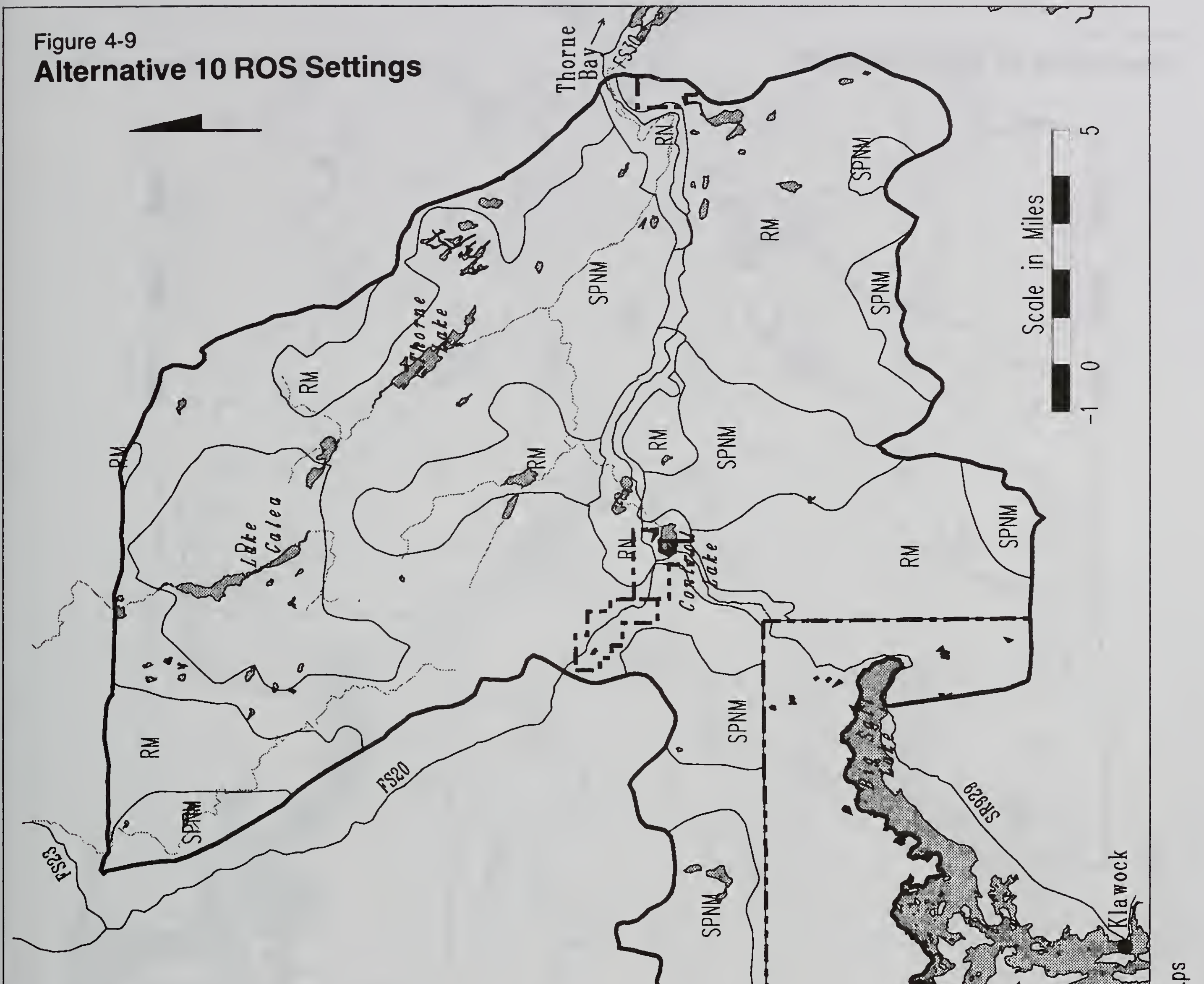


Figure 4-10
Alternative 11 ROS Settings

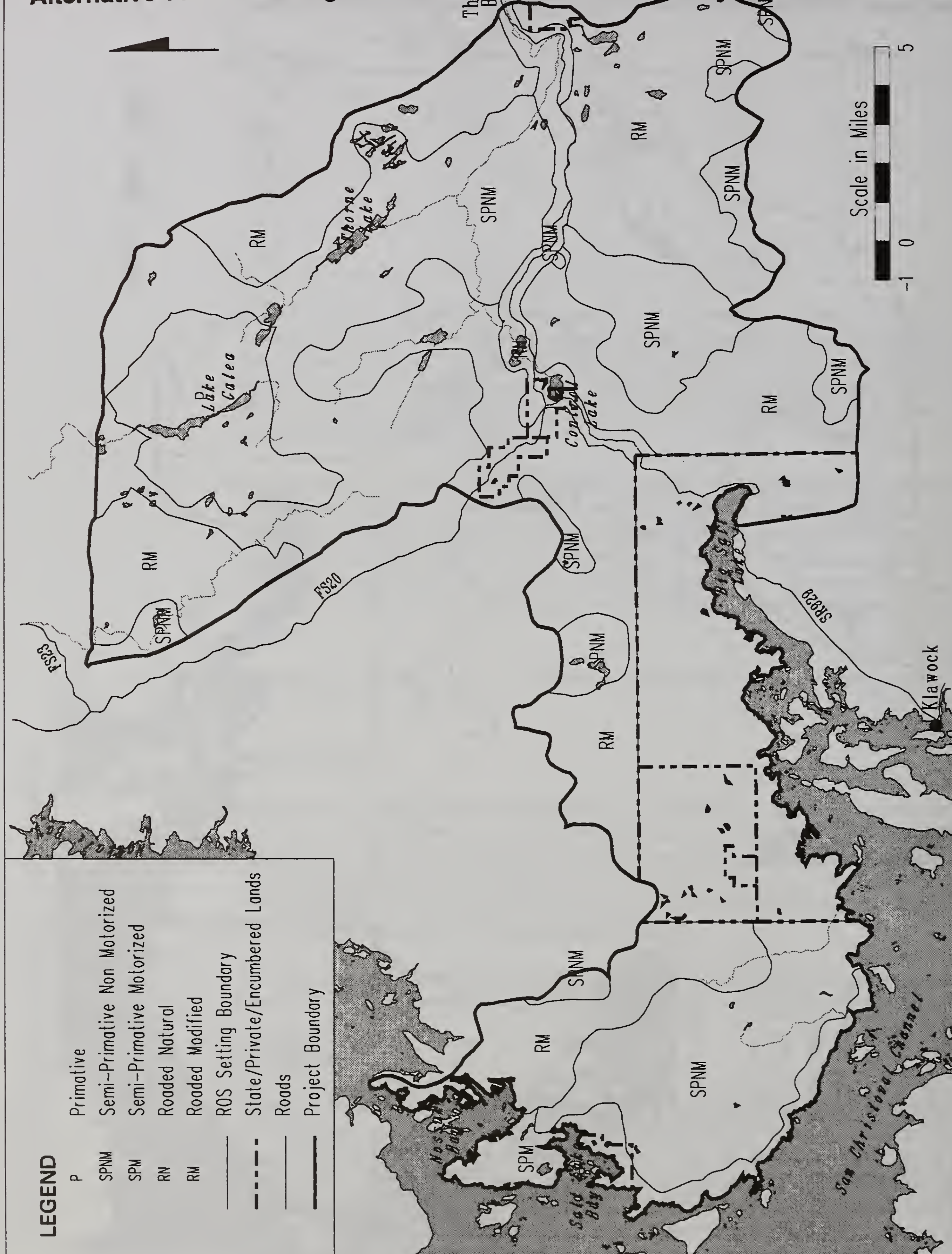
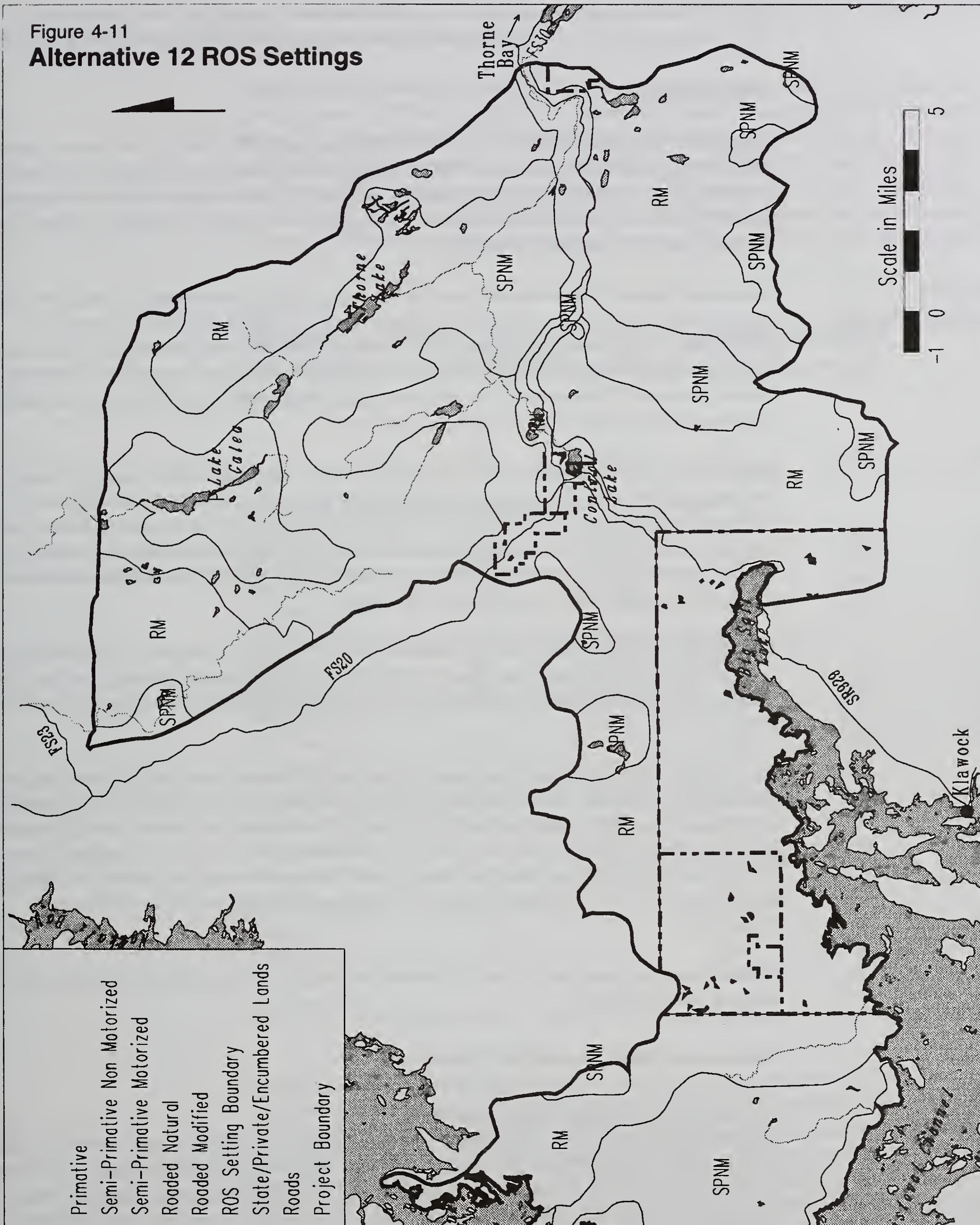


Figure 4-11
Alternative 12 ROS Settings



The amount of acreage classified as RM with Alternative 11 would increase approximately 28,557 acres to 78,049 acres, which would comprise approximately 46 percent of the Project Area.

Alternative 12

Alternative 12 would reduce the size of the P setting around Lake Galea by 3,482 acres. Alternative 12 would increase the amount of RM settings by 36,760 acres and decrease the amount of SPNM settings by 32,639 acres. Relative to Alternative 11, most changes would occur primarily near Elevenmile Creek, Steelhead Creek, Lower Logjam Creek, Upper Thorne River, Lake Galea, and along the 30 Road (Forest Road #9).

Impacts on Recreation Places

Recreation Places (RP's) are specific areas where recreation activities occur. Within RP's, there can be a wide range in the number of activities that occur. The quality and setting of the environment (which is characterized by ROS settings found in the RP) around RP's plays an important role in the type of activities that occur at the RP, as well as the quality of the recreation experience. The type and ease of access to RP's also influences the types of recreational activities and the quality of the recreation experience.

Timber harvest and associated activities can temporarily and permanently change the quality and setting of RP's (and ROS settings within RP's). Where roads are built, roaded access to RP's previously not accessible by road can offer opportunities for roaded recreation, and at the same time, reduce or eliminate opportunities for secluded, nonroaded recreational experiences. Timber harvest activities can also change the visual quality of RP's if those harvest activities and facilities can be seen or heard by recreationists.

To analyze the effects of the four alternatives on the RP's in the Project Area, all of the RP's were assigned to one of three categories: freshwater-, land-, and marine-based recreation. This assignment was determined by the type of physical setting required for activities that occur in the RP's.

The acreage of the various ROS settings for all of the RP's found in each of the three categories was totaled to determine the total acreage of each ROS setting for that category. For example, the acreage of the SPM setting for each of the four RP's found in the "marine-based recreation" group was added to give the total ROS setting of SPM for all marine-based recreation places. It is then possible to evaluate what the effects of each alternative would be on the SPM setting of marine-based RP's by comparing changes in acreage of SPM that would occur with each alternative.

The following sections discuss how the alternatives would change the ROS settings in the RP's found in the Project Area.

Freshwater-Based Recreation Places

Thorne River/Hatchery Creek Waterway

The three action alternatives would have varying effects on the 11 freshwater-based RP's that are associated with the Thorne River/Hatchery Creek waterway. Recreation along the waterway includes activities such as fishing, canoeing, hunting, and wildlife viewing. Although roads currently provide access to the waterway at either end of the waterway contained within the Project Area, the remote, unroaded setting of most of the waterway is considered important for some recreationists using the waterway. Some of the alternatives would require road entry into currently unroaded, remote areas. The roads would increase potential access to the waterway, which would negatively affect activities dependent on or enhanced by remote, unroaded

conditions. Leaving some of the roads open would offer opportunities for roaded recreation, in areas where it does not currently exist.

Changes in ROS Settings—The 11 RP's currently contain approximately 31,913 acres of unroaded area (P, SPNM, and SPM). Alternatives 10 and 11 would affect the ROS settings in the vicinity of the Thorne River/Hatchery Creek Waterway only very slightly. The acreage of land in recreation places along the Thorne River/Hatchery Creek Waterway, that would be classified as RM, would range from approximately 206 acres under Alternative 10 to 955 acres with Alternative 12 (Table 4-78). Alternative 12 would have a larger effect on RP's along the waterway. Although it would shrink in size, the area of P around Lake Galea would remain.

Table 4-78

Changes in ROS Settings Found in Freshwater-Based, Land-Based, and Marine-Based Recreation Places by Alternative

	P	SPNM	SPM	RN	RM
Freshwater-Based - Thorne River/Hatchery Creek Waterway					
Existing	5,485	12,457	0	1,588	97
Alternative 10	5,485	12,389	0	1,506	206
Alternative 11	5,485	11,587	0	1,675	841
Alternative 12	4,329	12,534	0	1,769	955
Freshwater-based - Out of Thorne River/Hatchery Creek Waterway					
Existing	0	3,595	0	1,641	2,750
Alternative 10	0	3,415	0	1,655	2,917
Alternative 11	0	3,449	0	1,048	3,489
Alternative 12	0	3,449	0	1,048	3,489
Land-Based					
Existing	0	6,465	0	0	3,069
Alternative 10	0	6,483	0	43	3,003
Alternative 11	0	5,565	0	10	3,970
Alternative 12	0	4,709	0	0	4,826
Marine-Based					
Existing	0	0	3,913	0	1,161
Alternative 10	0	0	3,913	0	1,161
Alternative 11	0	0	3,913	0	1,161
Alternative 12	0	0	3,913	0	1,161

Changes in Recreational Experiences—Although no harvest units under any alternative would be apparent from the waterway to the casual forest visitor, the alternatives would have different effects on the quality of recreation experiences possible along the waterway. Although harvest units would not be noticeable to the casual forest visitor, road construction and harvest activities in the vicinity of the waterway would be heard and would temporarily change the remote qualities of the waterway during the harvest period. In addition, even if roads are closed after harvest, they would provide increased access to remote portions of the waterway and reduce the quality of the remote recreational experience.

Upon completion of harvest activities, most harvest-related roads under all alternatives would be closed. Although roads would be closed to automobiles, they would likely be used to some degree by recreationists on four-wheelers, trailbikes, and other all-terrain vehicles. Several roads near the lower Thorne River would remain open and would permit roaded access to recreation resources that had been previously inaccessible by vehicle.

Outside of Thorne River/Hatchery Creek Waterway

Four of the six RP's contained in this grouping contain lakes outside of the Thorne River/ Hatchery Creek Waterway. The other two RP's are oriented around Rio Roberts Creek. Two of the lakes (Control Lake and Balls Lake) are significant local recreation resources. The acreage of ROS settings for the RP's would vary little among the alternatives. However, the effects on specific locations and recreation resources will vary noticeably among alternatives.

Changes in ROS Settings—There would be little difference among the three action alternatives in terms of the cumulative changes in the ROS settings of the RP's. The three alternatives would have similar effects in converting SPNM to RM (Table 4-78). Less than 200 acres would be involved with each alternative. There would be slightly more of a difference between the alternatives in the amount of RN converted to RM. Overall, the increase in RM would range from approximately 167 acres (Alternative 10) to 739 acres (Alternative 12).

Changes in Recreational Experiences—The acreage of the various ROS settings found in the RP's would not vary significantly among the alternatives. Harvest activities and road building would be heard by recreationists using these RP's.

Land-Based Recreation Places

The Land-Based Recreation Places category consists of four RP's, three of which are located in the uplands along the northeast boundary of the Project Area. The fourth land-based RP is located in the Thorne Mountains. These RP's are difficult to access and probably receive the least visitation of the four different resource-based RP's. The most popular recreational activities engaged in at these land-based RP's is big game hunting. The alternatives would have varying effects on the existing conditions of land-based RP's.

Changes in ROS Settings

Alternative 12 would convert approximately 1,757 acres of SPNM to RM, which would be the most of any alternative. An SPNM area in the northeast corner of the Project Area would be connected with the Thorne River/Hatchery Creek Waterway SPNM area.

Changes associated with Alternative 10 would be slight. As a result, it would cause the least amount of change to the existing conditions of any of the alternatives.

Changes in Recreational Experiences

Roads and timber harvest units would change the remoteness and visual character of some of the RP's. In the long-term, harvest activities could negatively affect deer populations, which could affect recreational hunting success in the RP's. Introducing harvest units and roads into the RP's would change the visual quality and remote character currently found in some of the RP's.

Marine-Based Recreation Places

Four RP's have been classified as marine based. All four RP's are located along the shores of the Western Peninsula. Although there are no visitation numbers available, it is believed the coast of the Western Peninsula is not heavily used for recreation. Recreational activities that occur include fishing, hunting, boating, and camping. None of the alternatives would have any effect on these RP's.

Impacts to Recreation Sites

As discussed in Chapter 3, recreation sites are specific locations where existing or potential recreational activities can occur. Some recreation sites have facilities, such as cabins, that recreationists use. Others are simply good locations for specific activities, such as anchorages that are sited in areas that offer safe moorage and frequently have freshwater sources nearby.

Timber harvest activities can affect the recreational experiences available at recreation sites. As new roads are built for timber harvest, remote recreation sites generally become accessible to more people. As the Prince of Wales Island road system expands because of timber harvest activities, there will be additional areas for people to visit via motor vehicle. As more people visit the island, there will be greater use of recreation sites in roaded ROS settings due to increased accessibility by motor vehicle. There will be a corresponding decrease in recreation sites located in roadless ROS settings.

Tables 4-79 and 4-80 illustrate that the four alternatives would not change the ROS settings where existing and potential recreation sites are located.

The three action alternatives would have a greater impact on the ROS settings of potential recreation sites than those of existing recreation sites. All of the alternatives would reduce the number of recreation sites located in SPNM settings from eight to five or four. The number of settings located in RM settings would increase from zero with the existing condition to two or three. As a result, with all the alternatives there would be more opportunities for recreational opportunities at potential recreational sites in roaded settings than non-roaded settings.

The opportunities for recreating at existing and potential recreation sites located in remote undisturbed areas would decrease with all the alternatives, while opportunities for recreation in roaded areas would increase. However, closing roads at the completion of harvest would restrict roaded access to those recreation sites that would be located in roaded areas. The closed roads could, however, be used by recreationists walking or riding all-terrain vehicles in order to gain access to remote recreation sites.

Table 4-79
ROS Settings of Existing Recreation Sites by Alternative

ROS Setting	Existing	Alt. 10	Alt. 11	Alt. 12
P	1	1	1	1
SPNM	1	1	1	1
SPM	9	9	9	9
RN	5	5	5	5
RM	0	0	0	0
Total	16	16	16	16

Table 4-80
ROS Settings of Potential Recreation Sites by Alternative

ROS Setting	Existing	Alt. 10	Alt. 11	Alt. 12
P	0	0	0	0
SPNM	5	4	4	4
SPM	3	3	3	3
RN	4	3	3	3
RM	0	2	2	2
Total	12	12	12	12

Commercial Outfitters and Guides

As discussed in Chapter 3, it is difficult to establish the amount of use the Project Area receives from outfitters and guides. Twenty-seven special-use permits from the Forest Service were requested by outfitters and guides for streams and lakes in the Project Area in 1993, including nine for the Thorne River. There has been some interest expressed by outfitters in taking clients on canoe/kayak trips along the Thorne River/Honker Divide Waterway. Two outfitters expressed interest in providing tours through the Thorne River/Hatchery Creek Waterway (personal communication, November 4, 1993, K. Lakemore, Owner, Alaska Discovery Tours, Juneau, Alaska; letter, June 20, 1994, B. Burdett, owner, Southeast Exposure, Ketchikan, Alaska).

It is not known how much local guides and outfitters use the Western Peninsula of the Project Area and the coastal areas near the Project Area; however, it is known that these areas receive some use from operators working out of Klawock and Craig.

In 1985, 72 "access-oriented" outfitters operating in Southeast Alaska were surveyed to determine what environmental qualities were important for their businesses. The outfitters and guides reported that the five most important characteristics were, in descending order of importance, scenery, wilderness, wildlife, fishing, and solitude (Bright, 1985). The single most frequently mentioned activity (34 percent of respondents) that would cause outfitters and guides to avoid an area was timber harvest. The second most frequently mentioned activity was "heavy use" of an area by other people.

All of the alternatives would change the "scenery" and "wilderness" characteristics of various parts of the Project Area to varying degrees. Although no harvest activities would be noticeable from the waterway by the casual forest visitor, noise could be heard along the waterway during harvesting. In addition, roads would allow increased access near the waterway, both during and after the harvest period. As a result, outfitters and their clients would experience more frequent encounters with other recreationists.

For all alternatives, timber harvest activities would at least temporarily disturb some of the wilderness qualities currently found along the Thorne River/Hatchery Creek Waterway. The two outfitters mentioned above (Alaska Discovery Tours and Southeast Exposure) expressed concern that harvest activities in the Honker Divide could change the type of experience possible, and compromise the potential of the area for outfitters (personal communication, November 4, 1993, K. Lakemore, Owner, Alaska Discovery Tours, Juneau, Alaska; letter, June 20, 1994, B. Burdett, owner, Southeast Exposure, Ketchikan, Alaska).

Although the degree of impact the alternatives would have on potential outfitter and guide use of the project area is difficult to determine, general assumptions can be made. The effects of Alternatives 10 and 11 would be negligible because of the low amount of harvest in the vicinity and the fact that the road system would not be extended anywhere close to Honker Divide. It can be assumed that Alternative 12 would have a slightly greater impact on outfitter and guide use of the Thorne River/Honker Divide than Alternatives 10 and 11 because Alternative 12 would have more harvest activity in the vicinity of the waterway, and would extend the road system closer to Lake Galea.

Effects of Timber Industry Facilities and Employees

The establishment of logging facilities, such as roads and camps in remote areas, can impact recreation near those facilities for the duration of harvest activities. It can be assumed that logging personnel partake in at least some of the recreational opportunities available in a project area. Activities such as fishing and hunting would be expected to be particularly popular. Impacts to local fish and game populations from employee hunting and fishing activities would be difficult to predict. Impacts to subsistence users and other recreationists as a result of employee hunting and fishing in an area would also be difficult to estimate. However, Schwan concluded in the *Southeast Alaska Sport Fish Assessment* that employees at logging camps often, "place heavy pressures on local stocks." Schwan further stated that popular species such as steelhead and cutthroat trout are frequently targeted and traditional users "may be forced" to find new fishing areas (Schwan, 1984).

Employee-generated impacts from the Control Lake timber sale would not be as great as with other sales. Because most of the logging personnel that would be involved in the Control Lake timber sale would be expected to already live in existing communities, there would be no need for logging camps. As a result, many of the impacts associated with employees living in remote logging camps would not occur during the Control Lake timber sale.

The primary impacts from logging personnel that could be expected from any of the alternatives associated with the Control Lake sale, would be from the roaded access that logging personnel would have to previously inaccessible areas. Current recreational users of those areas, may avoid such areas due to the presence of new users, increased competition for resources, or changes in the characteristic settings of those areas (changes in perceived solitude and remoteness).

Road Management

The introduction of roads into previously unroaded areas has both positive and negative consequences for recreation. The negative consequences can be attributed to changes in the characteristics and attributes of unroaded areas, and the resulting impacts to recreation activities that require those attributes. On the other hand, roads can make an area accessible for recreational activities that do not require unroaded characteristics and attributes.

Some of the roads that would be built under the various alternatives would remain open to allow for recreational access. Other new roads would be closed to public access to protect resources such as big game. See *Access Management* in the *Transportation and Facilities* section. The *Mitigation* section discusses specific road management issues.

Roadless Areas

All of the alternatives would reduce the amount of land in the Project Area classified as unroaded (Table 4-81). Unroaded areas are here defined as the ROS settings P, SPNM, and SPM (see Chapter 3).

Table 4-81
Roadless Areas (Within Project Area) Under Each Alternative

Roadless Area	Existing	Alt. 10[1/]	Alt. 11[1/]	Alt. 12[1/]
Kogish (509)	52,575	51,140	39,296	36,851
Karta (510)	20,968	14,979	15,226	13,421
Thorne River (511)	55,946	55,946	52,381	48,427
Total	129,489	122,065	106,656	98,699
% Change in Roadless Area	-	(-6%)	(-18%)	(-24%)

1/ Estimate based on the change in unroaded ROS classes (P, SPNM, SPM).

Alternative 12 would result in the least amount of unroaded area of the alternatives. Approximately 98,699 acres would be left in a roadless condition. Alternative 10 would leave the most roadless area of the three action alternatives, approximately 122,065 acres.

The following discusses the effects of the alternatives on the three roadless areas found in the Project Area.

Kogish (Roadless Area 509)

The Kogish Roadless Area is located in the Western Peninsula portion of the Project Area. Alternative 10 would result in minor harvest activity in the roadless area resulting in a reduction in its size of 3 percent. Alternatives 11 and 12 would reduce the size of the roadless area by 25 to 30 percent.

Karta (Roadless Area 510)

Alternative 12 would reduce the size of the Karta roadless area located in the Project Area by 36 percent. Alternative 11 would result in the smallest size reduction producing a 27 percent change in the size of the Karta Roadless Area.

Thorne River (Roadless Area 511)

Alternative 12 would have the greatest effect on the existing Thorne River Roadless Area found in the Project Area resulting in a 13 percent size reduction. Alternative 11 would result in a 6 percent change and Alternative 10 would produce no change in the size of this roadless area

Effects on Wild and Scenic Rivers

As mentioned in Chapter 3, the Thorne River/ Hatchery Creek system has been recommended for Scenic and Recreation Classification for inclusion into the National Wild and Scenic River System as the result of having four outstandingly remarkable values. The four values are fish, wildlife, recreation, and scenery.

The lower 6 miles of the river system meet the criteria for Recreation River classification. The remaining 36 miles of the system meet the criteria for Scenic River classification. The river system has a 0.5-mile protective corridor on either side of the river system. The corridor is composed of an inner 0.25-mile-wide zone on each side of the river which is defined by the TLMP Revision (1997) as a Scenic/Recreation River LUD.

No harvest units or roads in any of the alternatives fall within the 0.25-mile inner zone, although all the alternatives would place some units within the outer zone. Harvest Units 597.1-404, 597.1-406 and 597.2-425 would be located on the boundary of the inner zone with Alternative 12. The river segment in which the units are located meets the criteria of a scenic river. The segment would continue to meet that criteria even with harvest of the units, as long as the units or roads were not located in the inner zone. None of these units occurs in Alternative 10 or 11.

Wilderness

The Karta Wilderness would be minimally affected by project related harvest activities. All of the alternatives would have some harvest units located within 0.5 mile of the border of the Karta; although none would be within 0.25 mile. Harvesting units located adjacent to or near the Karta would change the ROS settings of some lands in and near the Wilderness. All of the alternatives would convert approximately 4,000 acres of the Project Area near the Wilderness presently classified SPNM to RM. An additional 500 acres within the Wilderness currently classified as SPNM would be converted to RM.

Cumulative Effects

Although increases in the amount of recreation use that will occur in the future in the Project Area are difficult to determine, visitation in the Tongass National Forest and Prince of Wales Island has grown rapidly in the past few years (USDA Forest Service, 1991). This growth includes the number of arrivals, modes of transportation, and types of activities. Past and current studies indicate the main attractions for recreationists include scenery, wildlife, feelings of remoteness, and a sense of vastness. These trends are likely to continue. The marine and undeveloped character of the Tongass National Forest and Prince of Wales Island play an important role in attracting recreationists and in meeting their expectations.

As the Project Area changes over time, so may the makeup of visitors and the activities they pursue. As the complexion of the forest setting and associated recreation resource change, recreationists will have three general options. Many will adapt to the new situations. Setting changes and changes in the character of other recreationists will have little or no impact to some of the current forest users. For others, the changing scenario may not be acceptable, and these users will be displaced to other areas where the setting and use patterns are more in line with their expectations and needs. Still others may find they can neither adapt to the new situation nor find new areas to use, and thus may substitute other activities for their leisure time.

The most popular and fastest growing recreational activity demands are those associated with Semi-Primitive Motorized ROS class setting (USDA Forest Service, 1991). Activities associated with P and SPNM settings are the second most popular and second fastest growing activities in the Tongass National Forest. The activities least in demand but also growing, are those associated with Roaded settings.

Setting changes are generally recognized as a one-way street, moving toward the developed end of the ROS spectrum. Given enough time, roaded settings in the Southeast Alaska rainforest can revert to semiprimitive conditions. The analysis indicates that, as the Project Area is developed over the next decade, an over-supply of roaded settings in the Tongass National Forest will exist. At the same time the Tongass National Forest is large enough that an adequate supply of P and SPNM settings will remain. However, projected use indicates that SPNM settings, characteristic of the marine interface, will reach capacity within the decade.

Tourism is also tied directly to the natural scenery, vastness, and remoteness of the area. Some of the tourism opportunities from cruise ships and the like will remain unaffected as long as scenery along critical travel routes remains natural appearing. The adventure traveler requires quality-based opportunities, and will compete for capacity of certain settings as the forest changes over time. Certain groups of recreationists, such as off-road vehicle users, will find activities enhanced as the forest is developed over time, while others will find opportunities lessened.

As use and demand increase, more competition for resources will occur. For some of these resources, such as fishing, substitute opportunities may be present in a different area, or the change in settings may make little difference as long as the sought-after resource is in ample supply. For other resources, such as solitude, there may be no substitute.

Social encounters will also increase over time. This may not have a great impact in modified settings. The impact will be felt most in the undeveloped settings, especially in those alternatives that reduce these settings the most. As P and SPNM settings are reduced, conflicts between users will likely increase as well, the degree being relative to the amount of change in the alternatives. This conflict may be between user groups engaged in different activities, such as Motorized versus Non-Motorized, or between residents and tourists vying for the same unique opportunities with few substitutes.

ROS Settings

Prior to the Long-term Contract, the vast majority of Prince of Wales Island would have been designated with ROS settings of P or SPNM. Timber harvest activities have changed the landscape of parts of Prince of Wales Island, and have introduced roads into unroaded areas. As a result, the amount of land previously classified as SPNM and P has decreased and opportunities for recreation in those areas has been diminished. Current, planned, and reasonably foreseeable harvest activities on Prince of Wales Island have, and will continue to, reduce opportunities for recreation in remote, primitive areas.

While the amount of P and SPNM has decreased, the amount of RM land on Prince of Wales Island has increased. As a result, there has been an increase in the amount of land that recreationists can access by road. Timber harvest will continue to result in new roads, and the amount of land where roaded recreation could occur will also increase.

Timber harvesting and road building will continue on Prince of Wales Island, but to a much lower extent under the new Forest Plan (1997). The Control Lake alternatives would contribute to the loss of P and SPNM areas and the subsequent increase in RM areas. As long as the TLMP recreation standards and guidelines are followed, the current and future changes to ROS settings that will occur as a result of timber harvest activities will be consistent with the TLMP.

Recreation Places

As with ROS settings, timber harvest activities are changing the recreational experiences available at RP's. As new roads are built for timber harvest, some remote RP's will become accessible to greater numbers of people. As the Prince of Wales Island road system expands as a result of timber harvest activities, there will be additional areas for people to visit via motor vehicle. As more people visit the island, there will be greater use of recreation resources, particularly those accessible by roads or located near roads. All of the alternatives would result in the construction of new roads, some of which would be left open upon completion of harvest activities to provide roaded access to RP's. Other roads would be closed upon completion of harvest activities, in part to restrict roaded access to some remote RP's.

Good fishing offers one of the more popular forms of recreation in the Project Area.

Recreation Sites

Timber harvest activities change the recreational experiences available at specific existing and potential recreation sites. As new roads are built for timber harvest, remote recreation sites will become accessible to greater numbers of people. As the Prince of Wales Island road system expands as a result of timber harvest activities, there will be additional areas for people to visit via motor vehicle. As more people visit the island, there will be greater use of recreation sites, particularly those accessible by road. All of the alternatives would result in the construction of new roads, some of which would make existing and potential recreation sites accessible by road.

For those recreationists that desire less accessible, more natural appearing recreation sites, roads and timber harvest activities will likely have a negative effect on their satisfaction levels at specific recreation sites. The opportunities for recreating at remote, undisturbed recreation sites will decrease throughout Prince of Wales Island as roads reach many remote sites and harvest activities change the character of the landscape near those sites. As a result, recreationists desiring remote, unroaded recreation sites will have fewer choices on Prince of Wales Island available to them.

Mitigation

Harvest activities change recreational opportunities in an area. Mitigation efforts can reduce impacts to certain types of recreation opportunities, and enhance opportunities for others. The mitigation measures outlined for the Control Lake Project Area attempt to accomplish two objectives.

One objective is to preserve most of the unroaded recreational opportunities that exist along the Thorne River-Hatchery Creek. To that end all roads, except those that would be kept open for recreational purposes, would be closed at completion of harvest activities (see Access Management in the Transportation and Facilities section). Some roads in the southern most part of the Honker Divide would remain open to selected points to allow access to the waterway. Closing all other roads would prevent authorized roaded access in many areas of the Project Area in order to preserve undeveloped, semi-primitive recreational opportunities.

The other major recreational objective for mitigation efforts is to provide more recreational opportunities for local recreationists and more roaded recreational opportunities. New facilities

such as roads, parking areas, short access trails from roads to lakes, streams, and interpretive facilities are proposed. The following mitigation measures provide additional recreational opportunities in the Project Area. All of these measures require future funding in order to be implemented.

Thorne River-Hatchery Creek Waterway/Honker Divide

The middle and upper areas of the waterway will remain as pristine and primitive as possible for the enjoyment of recreationists seeking a primitive experience along a unique (in Southeast Alaska) waterway. The lower section will continue to accommodate more recreationists as a result of existing access to the waterway from existing roads.

All new roads in the Honker Divide area will be closed upon completion of harvest activities to keep the area as remote as possible, and to minimize the effects of roads on roadless area recreational opportunities.

Monitoring

The TLMP (1997) proposes the ROS settings be reviewed annually to verify consistency with the Ketchikan Area Monitoring Strategy (Recreation Monitoring Item 1). In addition, VQO's are to be monitored to verify compliance with adopted VQO's (Visual Resource Monitoring Item 1).

Chapter 5

References

Chapter 5

References

Ackerman, Robert E., Kenneth C. Reid, James D. Gallison, and Mark E. Roe. 1985. *Archaeology of Heceta Island. A Survey of 16 Timber Harvest Units in the Tongass National Forest, Southeastern Alaska.* Center of Northwest Anthropology, Washington State University, Pullman, Washington.

Ackerman, Robert E., Kenneth C. Reid, and James D. Gallison. 1987. *Archaeology of Thorne Bay. A Survey of 22 Timber Harvest Units on Prince of Wales Island, Southeastern Alaska.* Center of Northwest Anthropology, Washington State University, Pullman, Washington.

ADEC (Alaska Department of Environmental Conservation). 1990; Alaska Nonpoint Source Pollution Control Strategy. State of Alaska, Department of Environmental Conservation, Division of Environmental Quality.

ADF&G (Alaska Department of Fish and Game). 1991. Sport Fishing Guide, Prince of Wales Island Area. Alaska Department of Fish and Game Division of Sport Fish, Ketchikan, Alaska.

____________ 1994. Goshawk ecology and habitat relationships on the Tongass National Forest 1994 field season progress report. USDA Forest Service Contract No. 43-0109-4-0209. Alaska Department of Fish and Game, Division of Wildlife Conservation. 24 pp.

ADNR (Alaska Department of Natural Resources). 1988. Prince of Wales Island Area Plan, Volume I. Alaska Department of Natural Resources, Anchorage, Alaska.

Alaback, P. B., 1982. Forest Community Structural Changes During Secondary Succession in Southeast Alaska. Forest Succession and Stand Development Research in the Northwest: Proceedings of the Symposium in 1981, March 26. Forest Research Laboratory, Oregon State University, Corvallis, Oregon.

__________ 1988. Endless Battles, Verdant Survivors. Natural History 97.

Alaback, P. B. and J.C. Tappeiner, II. 1984. Response of Understory Variation to Thinning in the Sitka Spruce-Western Hemlock Forest of Southeastern Alaska. Cooper Study with U.S. Forest Service Forestry Sciences Lab. Juneau, Alaska.

Alaska Climate Center. 1986. Technical Note No. 3.

Alaska Commercial Fisheries Entry Commission, Alaska Department of Labor, Research, and Analysis Section. USDA Forest Service IPACS Analysis, March 1990.

Aley, T., C. Aley, W.R. Elliot, P. W. Huntoon. 1993. Karst and cave resource significance assessment, Ketchikan Area, Tongass National Forest, Alaska. Ozark Underground Laboratory. Protem, Missouri.

5 References

Amaral, M. J. 1985. The Aleutian Canada Goose. In: R. L. Di Silvestro (ed.), pp. 437-442. Audubon Wildlife Report 1985. The National Audubon Society. New York, New York.

Ambrose, R. E., R. J. Ritchie, C. M. White, P. F. Schempf, T. Swem, R. Kittrick. 1988. Changes in the status of peregrine falcon populations in Alaska. Chapter 11 in Peregrine Falcon Populations-Their Management and Recovery, edited by T. J. Cade, J. H. Enderson, C. G. Thelander, and C. M. White. The Peregrine Fund, Inc., Boise, Idaho.

Anderson, C. M., P.M. DeBruyn, T. Ulm, and B. Gassoin. 1980. Behavior and ecology of peregrine falcons wintering upon the Skagits Flats, Washington: A Report on the 1980 Field Season. Washington Department of Game. 54 pp.

Armstrong, RH. 1991. Guide to the Birds of Alaska. Alaska Northwest Books. Bothell, Washington.

Arndt K., R. Sackett, and J. Ketz. 1987. A Cultural Resource Overview of the Tongass National Forest, Alaska. Report to the USDA Forest Service, Tongass National Forest, Forest Service Region 10, Juneau, Alaska.

Baichtal, J. F. 1991. Management of the Karst Areas within the Ketchikan Area of the Tongass National Forest, Southeastern Alaska. Proceedings of the National Cave Management Symposium, Sponsored by the American's Cave Conservation Association, Bowling Green, Kentucky.

Baker, C. S., L. M. Herman, A. Perry, W. S. Lawton, J. M. Strategy. 1985. Population characteristics and migration of summer and late-season humpback whales *(Megaptera novaeangliae)* in Southeastern Alaska. Mr. Mamm. Sci. 1(4):304-323.

Baker, R. and T. Stewart. 1993. Fisheries and Watershed Resource Report for the Polk Inlet Project Area. Prepared for the USDA Forest Service by Ebasco Environmental, Bellevue, Washington.

Bartlet, P. E. 1977. Management of the American Goshawk in the Black Hills National Forest. M. S. Thesis, University of South Dakota, Vermillion, South Dakota.

Bartos, L. 1989. A New Look at Low Flows after Logging. In: E. B. Alexander (ed.), pp. 99-98. Proceedings of Watershed '89, March 21-23, Juneau, Alaska. R1O-MB-77. USDA Forest Service, Alaska Region, Juneau, Alaska.

Batin, C. 1992. Steelhead, Fit For Royalty. Western Outdoors. April. Western Outdoors Publications. Costa Mesa, California.

Behler, J. L. and F. W. King. 1979. The Audubon Society Field Guide to North American Reptiles and Amphibians. Alfred A. Knopf, New York, New York.

Bellrose, F. 1976. Ducks, gees, and swans of North America. Stackpole Books, Harrisburg, Penn., and The Wildlife Management Institute, Washington, D.C. pp. 380-384.

Bent, A. C. 1942. Life Histories of North American flycatchers, larks, swallows, and their allies. U.S. Government Printing Office, Smithsonian Institution, United States National Museum Bulletin 179.

Beschta, R. L. 1980. Turbidity and Suspended Sediment Relationships. In: pp. 271-282. Proceedings, Symposium on Watershed Management, American Society of Civil Engineers.

Beschta, R. L. and W. S. Platts. 1986. Morphological Features of Small Streams: Significance and Function. Water Resources Bulletin. Vol. 22, No. 3, pp. 369-380.

Bilby, RE. and J. W. Ward. 1989. Changes in Characteristics and Function of Wood Debris with Increasing Size of Streams in Western Washington. Transactions of the American Fisheries Society. Vol. 118, pp. 368-378.

Binkley, D. and T. C. Brown. 1993. Management impacts on water quality of forests and rangelands. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-239, 114 pp.

Bishop, D. M. and M. E. Stevens. 1964. Landslides on Logged Areas in Southeast Alaska. Research Paper NOR-I. USDA Forest Service, Northern Forest Experiment Station, Juneau, Alaska.

Borman, F. H. and G. E. Likens. 1979. Pattern and Process in a Forested Ecosystem. New York, Springer-Verlag.

Boyce, J. S. 1994. Control Lake Timber Inventory Report. Prepared by Harza Northwest, Inc. Submitted by Enserch Environmental Corporation.

Boyce, J. A. and J. K. Goering. 1995. 1995 Timber and Vegetation Resource Report. Control Lake Environmental Impact Statement. USDA Forest Service, Tongass National Forest. Prepared by Harza Northwest, Inc. Submitted by Enserch Environmental Corporation.

Bright, L. 1985. Patterns of Tourism in Southeast Alaska: An Analysis of the Impacts of Wilderness Designations on the Tourism Industry. Research Paper Submitted to the School of Agriculture and Land Resources Management, University of Alaska, Fairbanks, Alaska.

Broderson, K. 1982. The Frogs and Toads in Alaska. Alaska Department of Fish and Game Wildlife Notebook Series.

Bryant, M.D. 1980. Evolution of Large Organic Debris After Timber Harvest: Maybeso Creek, 1949 to 1978. General Technical Report PNW-101. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

__________ 1983. The Role and Management of Woody Debris in West Coast Salmonid Nursery Streams. North American Journal of Fisheries Management Vol. 3, pp. 322-330.

Calkins, D. G. 1986. Marine Mammals. In: D. W. Hood and S.T. Zimmerman (eds.), pp. 527-560. The Gulf of Alaska Physical Environment and Biological Resources. Mineral Management Service Publication Number OCS Study: MMS 86-0095. U.S. Government Printing Office, Washington, D.C.

Carbyn, L. N. 1987. Gray Wolf and Red Wolf. In: Novak, M., J. A. Baker, M. E. Obbard, and B. Malloch (eds.), pp. 358-377. Wild Furbearer Management and Conservation in North America. Ontario Ministry Natural Resources, XVI.

5 References

Cederholm, C. J., L. M. Reid, and E. O Salo. 1981. Cumulative effects of logging road sediment on salmonid populations in the Clearwater River, Jefferson County, Washington. In: Proceedings from the Conference-Salmon-spawning Gravel: A renewable Resource in the Pacific Northwest? pp. 38-74.

Chen, J., J. F. Franklin, and T. A. Spies. 1992. Vegetation Responses to Edge Environments in Old-growth Douglas-fir Forests. Ecological Applications. Vol. 2, pp. 307-396.

Cheng, J. D. 1988. Subsurface Stormflows in the Highly Permeable Forested Watersheds of Southwestern British Columbia. Journal of Contaminant Hydrology. Vol. 3, pp. 171-191.

Clark, G. H. 1979a. Archaeological Testing at the Coffman Cover Site, Southeastern Alaska. Paper presented at the 32nd Annual Northwest Anthropology Conference, Eugene, and the 6th Annual Conference of the Alaska Anthropological Association, Fairbanks.

__________ 1979b. A Brief Preliminary Comparison of Polished Slate from Two Southeast Alaska Coastal Middens. Ms. on file, USDA Forest Service Alaska Regional Office, Division of Recreation Management, Juneau, Alaska.

__________ 1980. Archaeology of Coffman Cover, Southeast Alaska. In: *Cultural Resource Notes No.],* edited by Gerald H. Clark, pp. ii-13. USDA Forest Service, Alaska Region Report No. 116, Juneau, Alaska.

Clark, R.N. and D. R. Johnson. 1981. Selected findings from the Alaska Public Survey: A summary of responses from southeast and south central Alaska. An Interim Report. USDA, Forest Service; USDI, National Park Service; and University of Washington, College of Forest Resources, Seattle, Washington.

Clark, R.N., et al. 1984. Dispersed recreationists in three roaded multiple use forest areas of the Pacific Northwest. USDA Forest Service, PNW Forest and Range Experiment Station, Seattle, WA.

Clayton, J. L. 1981. Soil disturbance caused by clearcutting and helicopter yarding in the Idaho Baiholith. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Note INT-305, 7 pp.

COE (U.S. Army Corps of Engineers). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, Washington, D.C.

Confer, C. 1994. Draft Control Lake Project Area Wildlife Resource Report. Prepared by Harza Northwest, Inc.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. Washington, D.C.; U.S. Fish and Wildlife Service, Biological Services Program.

Craig, G. 1986. The Peregrine Falcon. In: R. L. Di Silvestro (ed.) Audubon Wildlife Report 1986. National Audubon Society, New York, New York.

Crocker-Bedford, C. 1990a. Status of the Queen Charlotte Goshawk. Planning Records, Tongass Land Management Plan.

__________ 1990b. Goshawk Reproduction and Forest Management. Wildlife Society Bulletin. Vol. 18, pp. 262-269.

__________ 1992. A Conservation Strategy for the Queen Charlotte Goshawk on the Tongass National Forest. Unpublished draft, March 1992, Ketchikan Area, Tongass National Forest.

Crocker-Bedford, D.C. and B. Chaney. 1988. Characteristics of Goshawk Nesting Stands. In: R. L. Glinski, B. G. Pendleton, M. B. Moss, M. N. LeFranc, Jr., B. A. Millsap, and S. W. Hoffman, (eds.), pp. 210-217. Proc. Southwest Raptor Management Symposium and Workshop. National Wildlife Federation Sci. and Tech. Ser. 11.

Davis, 5. 1990. Prehistory of Southeastern Alaska. In: W. Sturtevant (ed.), The Handbook of North American Indians. Volume 7, Northwest Coast.

Davis, S.D. 1977. *Archaeologic Reconnaissance of the Proposed Long Term Timber Sales Contract 1979-1984: Prince of Wales and Revillagigedo Islands.* USDA, Forest Service, Tongass National Forest, Ketchikan, Alaska.

DeGraaf, R. M., V. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and range-land birds on the United States. USDA Forest Service-Agriculture Handbook No. 688. 625 pp.

DeLaguna, F. 1990. Tlingit. In *Handbook of North American Indians,* vol. 7, edited by W. C. Sturtevant, pp. 203-228. Smithsonian Institution, Washington, D.C.

__________ 1992. *Under Mount Saint Elias. The History and Culture of the Yakutat Tlingit* Smithsonian Contributions to Anthropology Vol. 7, US Government Printing Office, Washington, D.C.

DellaSala, D. A., K. Engel, D. P. Volsen, R. L. Fairbanks, W. B. McComb, J. Hagar, and K. Radeke. 1993. Final Report 1993: Evaluation of Young Growth Treatments for Wildlife. USDA Forest Service Region 10, Juneau, Alaska.

DellaSala, D. A., K. A. Engel, D. P. Volsen, R. L. Fairbanks, J.C. Hagar, W. B. McComb, and K. J. Radeke. 1994. Effectiveness of silvicultural modifications of young-growth forest for enhancing wildlife habitat on the Tongass National Forest, Southeast Alaska. Enserch Environmental. Prepared for USDA Forest Service Region 10. Contract No. 53-0109-0-00-00304.

DeMeo, T. D. 1989. Preliminary Forest Plant Association Management Guide: Ketchikan Area, Tongass National Forest. USFS Forest Service, Ketchikan, Alaska.

DeMeo, T. E. and W. D. Loggy. 1989. Development of Wetlands Mapping Procedures for Forest Planning in Southeast Alaska. In: E. B. Alexander (ed.), pp. 57-72. Proceedings of Watershed '89. USDA Forest Service, Alaska Region, Juneau, Alaska.

Duncan, S. H. 1986. Peak Stream Discharge During Thirty Years of Sustained Yield Timber Management in Two Fifth-Order Watersheds in Washington State. Northwest Science. Vol. 60, pp. 258-264.

Eberlein, G. D., M. Churkin, Jr., C. Carter, H. C. Berg, and A. T. Ovenshine. 1983. Geology of the Craig Quadrangle, Alaska. U.S. Geological Survey, Open File Report 83-91.

Ehrlich, P. R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon & Schuster Inc., New York, NY.

5 References

Ellanna, L. J. and G. Sherrod. 1987. Timber Management and Fish and Wildlife Use in Selected Southeastern Alaska Communities: Klawock, Prince of Wales Island, Alaska. Technical Report No. 126. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska.

Enserch Environmental Corporation. 1994. Scoping Report, Control Lake Environmental Impact Statement. Prepared for U.S. Forest Service, Tongass National Forest, Ketchikan Area. Prepared by Enserch Environmental Corporation, Bellevue, Washington. November 1994.

EPA (U.S. Environmental Protection Agency). 1993. Guidance and Specifying Management Measure for Sources of Nonpoint Pollution in Coastal Waters. USEPA. Office of Water, Washington, D.C., 840-B-92-002.

Everest, F. H., N.B. Armantrout, S. M. Keller, W. D. Parante, J. R. Sedell, T. E. Nickelson, J. M. Johnston, and G. N. Haugen. 1985. Salmonids. In: E. R. Brown (ed.), pp. 199-230. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Everest, F. H., R. L. Beschta, J.C. Scrivener, K. V. Koski, J. R. Sedell, and C. J. Cederholm. 1987. Fine Sediment and Salmonid Production: A Paradox. In: E. O. Salo, and T. W. Cundy (eds.), pp. 98-142. Streamside Management: Forestry and Fisheries Interactions. University of Washington College of Forest Resources, Contribution No. 57. Seattle, Washington.

FEMAT Report. 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team. Portland, OR.

Finch, D. M. 1991. Population Ecology, Habitat Requirements, and Conservation of Neotropical Migratory Birds. USDA Forest Service General Technical Report RM-205.

Flynn, R. W. and L. W. Suring. 1989. Harvest Rates of Sitka Black-tailed Deer Populations in Southeast Alaska for Land Use Planning. Alaska Department of Fish and Game, Douglas, Alaska.

Forest Plan. See USDA Forest Service 1979a, 1986c, 1991 a.

Franklin, J. F. 1990. Old Growth and the New Forestry. In: Copenhagen, M. J. (ed.), Proceedings of the New Perspectives Workshop: Petersburg, Alaska, July 17-19, 1990. USDA Forest Service Regulation 10. Juneau, Alaska.

Franzreb, K. E. and R. D. Ohmart. 1978. The Effects of Timber Harvesting on Breeding Birds in a Mixed Coniferous Forest. Condor. Vol. 80, pp. 431-441.

Fuller, T. 1989. Population dynamics of wolves in north-central Minnesota. Wildl. Bonogr. 105. 41 pp.

Furniss, M. J., T. D. Raelafs, and CS. Yee. 1991. Road construction and maintenance. In: W.R. Meehan, ed. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19, pp. 297-323.

Gabrielson, I. N. and F. C. Lincoln. 1959. The birds of Alaska. The Stackpole Company, Harrisburg, Penn., and The Wildlife Management Institute, Washington D.C. pp. 206-211.

Galginaitis, M. 1994. Subsistence Resources inventory Report. Control Lake Environmental Impact Statement. Prepared by Impact Assessment, Inc. Submitted by Enserch Environmental Corporation.

Garfield, Viola E. and L. A. Forrest. 1961. *Wolf and the Raven: Totem Poles of Southeastern Alaska.* University of Washington Press.

Gates, J. E. and L. W. Gysel. 1978. Avian Nest Dispersion and Fledgling Success in Field-Forest Ecotones. Ecology. Vol. 59, pp. 871-883.

Godfrey, W. E. 1979. The birds of Canada. National Museum of Natural Sciences, Ottawa, Canada. 428 pp.

Golding, D. L. 1987. Changes in Streamflow Peaks Following Timber Harvest of a Coastal British Columbia Watershed. In: Forest Hydrology and Watershed Management, Proceedings of the Vancouver Symposium, August 1987, IAHS-AISH Publication No. 167, pp. 509-517.

Gollop, J. B. 1988. The Eskimo Curlew. In: W. J. Chandler (ed.), pp. 583-596. Audubon Wildlife Report 1988/89. The National Audubon Society. New York, New York.

Greenig, M. 1995. Recreation, Wild and Scenic Rivers, Wilderness Areas, and Lands Resource Report. Control Lake Environmental Impact Statement. Submitted by Enserch Environmental Corporation.

Gregory, S. and L. Ashkenas. Undated. Riparian Management Guide. U.S. Forest Service, Willamette National Forest, Eugene, Oregon.

Gustafson, J. 1994. The Franklin's Grouse of Southern Southeast Alaska. Alaska Department of Fish and Game. Unpublished Report.

Gutierrez, R. J. and A. B. Carey (eds.). 1985. Ecology and Management of the Spotted Owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Ranger Experiment Station, Portland, Oregon.

Halupka, K. C., J. K. Troyer, M. G. Wilson, and F. H. Everest. 1993 (Draft). Identification of unique and sensitive coho salmon stocks of Southeast Alaska. USDA Forest Service, Forest Sciences Laboratory, Juneau, Alaska.

Hamer, T. E. and E. B. Cummins. 1990. Forest Habitat Relationships of Marbled Murrelets in Northwestern Washington. Washington Department of Wildlife. Olympia, Washington.

Hanley, T. A. and C. L. Rose. 1987. Influence of Overstory on Snow Depth and Density in Hemlock-Spruce Stands: Implications for Management of Deer Habitat in Southeastern Alaska. USDA Forest Service. Res. Note PNW-RN-459.

Hansen, H. A. 1962. Canada geese of coastal Alaska. Trans. 27th North Am. Wldl. and Nat. Resour. Conf.:301-319.

Harmon, M. E. 1986. Logs as Sites of Tree Regeneration in *Picea Sitchensis-tsuga Heterophylla* Forests of Coastal Washington and Oregon. Ph.D. thesis, Oregon State University, Corvallis, Oregon.

Harmon, M. E. and J. F. Franklin. 1989. Tree Seedlings on Logs in *Picea-tsuga* Forests of Oregon and Washington. Ecology. Vol. 70, No. 1, pp. 48-59.

Harr, R. D. 1986. Effects of Clearcutting on Rain-on-Snow Events in Western Oregon: a New Look at Old Studies. Water Resources Research. Vol. 22, pp. 1095-1100.

Harr, R. D. and F. M McCorison. 1979. Initial effects of clearcut logging on size and timing of peak flows in a small watershed in Western Oregon. Water Resources Research 15:90-94.

Harr, R. D., A. Levno, and R. Merserau. 1982. Streamfiow changes after logging 130-year-old Douglass fir in two small watersheds. Water Resources Research 18:637-644.

Harr, R. D., R. L. Fredriksen, and J. Rothacher. 1979. Changes in Streamfiow Following Timber Harvest in Southwestern Oregon. USDA Forest Service, Pacific Northwest Range and Experiment Station, Research Paper PNW-249.

Harr, R. D., B. A. Coffin, and T. W. Cundy. 1989. Effects of Timber Harvest on Rain-on-Snow Runoff in the Transient Snow Zone of the Washington Cascades. Interim Final Report submitted to TFW Sediment, Hydrology and Mass Wasting (SHAM) Steering Committee, Timber-Fish-Wildlife Project, TFW-18A-89-003.

Harris, A. S. 1989. Wind in the Forests of Southeast Alaska and Guides for Reducing Damage. General Technical Report PNW-GTR-244. USDA Forest Service, Juneau, Alaska.

Harris, L. D. 1984. The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity. University of Chicago Press, Chicago, Illinois.

Heede, B. H. 1985. Interactions Between Streamside Vegetation and Stream Dynamics. In: pp. 54-58. Riparian Ecosystems and Their Management-Reconciling Conflicting Uses. General Technical Report RM- 120. Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service, Fort Collins, Colorado.

Heifetz, J., M. L. Murphy, and K. V. Koski. 1986. Effects of Logging on Winter Habitat of Juvenile Salmonids in Alaskan Streams. North American Journal of Fisheries Management. Vol. 6, pp. 52-58.

Hennessy, S. P. 1978. Ecological Relationships of Accipiters in Northern Utah-With Special Emphasis on the Effects of Human Disturbances. M.S. Thesis, Utah State University, Logan, Utah.

Hennon, P. E. 1990. Fungion, *Chamaecyparis nootkatensis.* Mycologia 82(l):59-66.

__________ 1992. Third reported outbreak of Hemlock Canker along roads of Prince of Wales Island. Forest Pest Management Report. Biological Evaluation RlO-TP-25. USDA Forest Service, Alaska Region. 9p.

Hicks, B. J., R. L. Beschta, and RD. Harr. 1991. Long-term changes in streamfiow following logging in Western Oregon and associated fisheries implications. Water Resources Research 27:217-226.

Hodge, R. P. 1976. Amphibians and Reptiles in Alaska, the Yukon, and Northwest Territories. Alaska Northwest Publishing Company, Anchorage, Alaska.

Hoffman, S. and G. Freeman. 1991. Thomas River Steelhead Creek and Recreation Survey, 1989-90. Fishery Data Series, No. 91-30. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage, Alaska.

Hogan, D. L. and D. J. Wilford. 1989. A Sediment Transfer Hazard Classification System: Linking Erosion to Fish Habitat. In: E. B. Alexander (ed.) pp. 143-155. Proceedings of Watershed '89. March 21-23, 1989, Juneau, Alaska, USDA Forest Service, Alaska Region R10-MB-77.

Holmes, C. E. 1980. *Archaeological Mitigation of the Thorne River Site (CRG-J77), Prince of Wales Island, Alaska.* Forest Highway No. 42, DT-FH7O-86-A-00003). Office of History and Archaeology Report No. 15. Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation.

Holtby, L. B. and J.C. Scrivener. 1989. Observed and Simulated Effects of Climatic Variability, Clear-cut Logging and Fishing on the Numbers of Chum Salmon *(Oncorhynchus keta)* and Coho Salmon *(Oncorhynchus kisutch)* returning to Carnation Creek, British Columbia. In: C.D. Levings, LB. Holtby, and M. A. Henderson (eds.), pp. 62-81. Proceedings of the National Workshop on Effects of Habitat Alteration on Salmonid Stocks. Canada Special Publication on Fish. Aquatic Sciences 105.

Irland Group. 1991. Assessment of adequacy of timber supply and analysis of potential effects of eliminating the Long-term Timber Sale Contract Areas-Tongass National Forest. Report to USDA Forest Service, Alaska Region. The Irland Group, Augusta, Maine.

Jackson, G. 1995. Soil Resource Report. Control Lake Environmental Impact Statement. Submitted by Enserch Environmental Corporation.

James, G. A. 1956. The Physical Effect of Logging on Salmon Streams of Southeast Alaska. Station Paper No. 5. USDA Forest Service, Alaska Forest Research Center, Juneau, Alaska.

Johnson, J. H. and A. A. Wolman. 1984. The Humpback Whale, *Megaptera novaengliae.* The Status of Endangered Whales. Marine Fisheries Review. Vol. 46 pp. 30-37.

Kahklen, K. F. 1994. Surface erosion from a forest road, Polk Inlet, Prince of Wales Island, Alaska. Master of Science Thesis, Oregon State University, Corvallis, Oregon, 90 pp.

Keller, E. A. and F. J. Swanson. 1979. Effects of Large Organic Material on Channel Form and Fluvial Processes. Earth Surface Processes. Vol. 4, pp. 361-380.

Kennedy, P. L. 1988. Habitat Characteristics of Cooper's Hawks and Northern Goshawks Nesting in New Mexico. In: Glinski et al. (eds.) Proceedings of Southwest Raptor Management Symposium and Workshop. National Wildlife Federation, Washington, D.C.

Kirchhoff, M.D. and J. W. Schoen. 1987. Forest Cover and Snow: Implications for Deer Habitat in Southeast Alaska. Journal of Wildlife Management. Vol. 51, No. 1, pp. 28-33.

Kolenosky, G. B., and S. M. Strathearn. 1987. Black Bear. Pages 442-455 *In* Wild Furbearer Management and Conservation in North America. M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Ministry of Natural Resources, Ontario.

Kruse, J. and R. Frazier. 1988. Tongass Resource Use Cooperative Survey (TRUCS). A report series prepared for 31 communities in Southeast Alaska. Prepared in cooperation with the USDA Forest Service and the Division of Subsistence of the Alaska Department of Fish and Game. University of Alaska, Institute of Social and Economic Research, Anchorage, Alaska.

Kruse, J., R. Frazier, and L. Fahlman. 1988. Tongass Resource Use Cooperative Survey Technical Report Number One, Research Design and Field Phase. University of Alaska, Institute of Social and Economic Research, Anchorage, Alaska.

Kruse, J. A. and R. M. Muth. 1990. Subsistence Use of Renewable Resources by Rural Residents of Southeast Alaska. University of Alaska, Institute of Social and Economic Research, Anchorage, Alaska.

Langdon, S. J. 1977. *Technology, Ecology, and Economy: Fishing Systems in Southeast Alaska.* Ph.D. dissertation Stanford University. University Microfilms, Ann Arbor.

Larsen, D. N. 1984. Feeding habits of river otters in coastal Southeast Alaska. JWM 48:1446-1452.

Lawrence, W. 1979. Pacific Working Group: Habitat Management and Land Use Practices. In: D. Burk (ed.), pp. 196-201. The Black Bear in Modern North America. Boone and Crockett Club. Amwell Press. Clinton, New York.

Lebeda, C. S. and T. J. Ratti. 1983. Reproductive Biology of Vancouver Canada Geese on Admiralty Island, Alaska. Journal of Wildlife Management. Vol. 47 pp. 297-306.

Lisle, T. E. 1986. Effects of Woody Debris on Anadromous Salmonid Habitat, Prince of Wales Island, Southeast Alaska. North American Journal of Fisheries Management. Vol. 6, pp. 538-550.

Lloyd, D.S., J.P. Koenings, and J. D. LaPerriere. 1987. Effects of Turbidity in Fresh Waters of Alaska. North American Journal of Fisheries Management. Vol. 7, pp. 18-33.

Lynch, J. F. and R. F. Whitcomb. 1978. Effects of the Insularization of the Eastern Deciduous Forest on Avifaunal Diversity and Turnover. In: Marmelstein, A., (ed.) Classification, Inventory and Analysis of Fish and Wildlife Habitat. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service OBS-78176, pp. 461-489.

Lyons, J. K. and R. L. Beschta. 1983. Land use, floods, and channel changes: upper Middle Fork Willamette River, Oregon (1936-1980). Water Resources Research 19:463-471.

MacDonald, L. H. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska. EPA/910/9-91-001 U.S. Environmental Protection Agency, Seattle, Washington.

Marcus, M.D., M. K. Young, L. E. Noel, and B. A. Mullan. 1990. Salmonid-Habitat Relationships in the Western United States: A Review and Indexed Bibliography. Technical Report RM- 188. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Marshall, D. B. 1988. Status of Marbled Murrelet in North America: With Special Emphasis on Populations in California, Oregon, and Washington. U.S. Fish and Wildlife Service, Portland, Oregon.

McAllister, KR. and B. Leonard. 1991. Past Distribution and Current Status of the Spotted Frog in Western Washington. 1990 Progress Report. Washington Department of Wildlife. Olympia, Washington.

McNeil, W. J. and W. H. Ahnell. 1964. Success of Pink Salmon Spawning Relative to Size of Spawning Bed Materials. U.S. Department of Interior, Special Scientific Report-Fisheries No. 469.

Mech, L. D. 1989. Wolf population survival in an area of high road density. Am. Midl. Nat. 121:387-389.

Mech, L. D., S. H. Fritts, G. L. Radde, and W. J. Paul. 1988. Wolf Distribution and Road Density in Minnesota. Wildlife Society Bulletin.

Meehan, W.R., WA. Farr, D. M. Bishop, and J. H. Patric. 1969. Some Effects of Clearcutting on Salmon Habitat of Two Southeast Alaska Streams. Research Paper PNW-82. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Megahan, W.F. and W. J. Kidd. 1972. Effects of logging and logging roads on erosion and sediment disposition from steep terrain. Journal of Forestry 70:136-141.

Mills, J. 1990. Harvest and Participation in Alaska Sport Fisheries During 1989. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage, Alaska.

Mobley, C. M. 1993. *The Klawock Oceanside Packing Company Cannery', Prince of Wales Island, Alaska.* Report prepared by Charles M. Mobley and Associates under contract to The Central Council of Tlingit and Haida Indian Tribes of Alaska, Anchorage, Alaska.

Moore, K. R. and C. J. Henny. 1983. Nest Site Characteristics of Three Coexisting Accipiter Hawks in Northeastern Oregon. Raptor Resource. Vol. 17, pp. 65-76.

Moore, M. K. 1977. Factors Contributing to Blowdown in Streamside Leave Strips on Vancouver Island. Providence of British Columbia, Ministry of Forests, Information Division, Land Management Report No. 3.

Morse, D. H. 1970. Ecological aspects of some mixed-species foraging flocks of birds. Ecol. Monogr. 40:119-168.

Moser, Jefferson. 1902. *Bulletin of the United States Fish Commission.* Government Print Office, Washington, D.C.

Murphy, M. and K. V. Koski. 1989. Input and depletion of woody debris in Alaska streams and implications for streamside management. North American Journal of Fisheries Management 9:427-436.

Murphy, M. L., J. Heifetz, S. W. Johnson, K. V. Koski, and J. F. Thedinga. 1986. Effects of Clearcut Logging With and Without Buffer Strips on Juvenile Salmonids in Alaskan Streams. Canadian Journal of Fisheries and Aquatic Science. Vol. 43, pp. 1521-1533.

National Environmental Policy Act (NEPA) of 1969, as amended. Public Law 91-90, 42 USC 4321-4327, January 1, 1970, as amended by Public Law 94-52, July 3, 1975, and Public Law 94-83, August 9,1975.

National Forest Management Act (NFMA). 1976. 36 CFR 219.

National Historic Preservation Act (NHPA). 1986.

National Marine Fisheries Service. 1991. Recovery Plan for the humpback whale *(Megaptera novaeangliae).* Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105p.

Nekamura, F. and F. J. Swanson. 1993. Effects of course woody debris on morphology and sediment storage of a mountain stream system in western Oregon. Earth Surface Processes and Landforms. 18:43-61.

Noss, R. F. 1983. A Regional Landscape Approach to Maintain Diversity. Bioscience. Vol. 33, pp. 700-702.

Noss, R. F. and L. D. Harris. 1986. Nodes, Networks, and MUMs: Preserving Diversity at All Scales. Environmental Manager. Vol. 10, pp. 299-309.

Nussbaum, R. A., E. D. Brodie, and R. M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho.

Oberg, Kalervo. 1973. *The Social Economy of the Tlingit Indians.* University of Washington Press, Seattle.

Olson, R. L. 1967. Social Structure and Social Life of the Tlingit in Alaska. *Anthropological Records Volume 26.* University of California Press, Berkeley.

Olson, Wallace M. 1989. Warm Chuck Village Report of 1989 Research. Department of Anthropology, University of Alaska Southeast.

Osgood, W. H. 1903. Smithsonian Institute Archives, Rec. Ut. 7176, Bx. 13, Fld. 17. USFWS 1890-1961. (Cited in Gustafson [19941).

Pace, F. 1991. The Klamath Corridors: Preserving biodiversity in the Klamath National Forest. In: Landscape, Linkages and Biodiversity. W. E. Hudson, Ed. Island Press, Covelo, CA.

Paradiso, J. L. and R. M. Nowak. 1982. Wolves. In: J. A. Chapman and G. A. Feldhamer (eds.), pp. 460-474. Wild Mammals of North America. The Johns Hopkins University Press, Baltimore, Maryland.

Paul, T. 1992. Southeast Alaska Black Bear, River Otter, and Marten Harvest 1988-1992, by WAA, by Community. Alaska Department of Fish and Game, Wildlife Conservation Division, Juneau, Alaska.

Patla, 5. 1990. Northern goshawk monitoring project report, 1989. Targhee National Forest, St. Anthony, Idaho. Final Report. USDA Forest Service, Targhee National Forest. 22p.

Paustian, S. J. 1987. Monitoring Nonpoint Source Discharge of Sediment from Timber Harvesting in Two Southeast Alaska Watersheds. In: Huntsinger, R. G. (ed.) pp. 153-168. Water Quality in the Great Land, Alaska's Challenge. Proceedings, Alaska Section, American Water Resources Association. Water Research Center, Institute of Northern Engineering, University of Alaska, Fairbanks. Report IWR-109.

Pearson, D. 1993. Ecology of the Alexander Archipelago wolf and responses to habitat change. Progress Report No. 2.

Pella, J. J. and R. T. Myren. 1974. Caveats Concerning Evaluation of Effects of Logging on Salmon Production in Southeastern Alaska from Biological Information. Northwest Science. Vol. 48, No. 2, pp. 132-144.

Pentec Environmental, Inc. 1991. The Cause of Adult Salmon Pre-spawner Mortality in Southeast Alaska. A report, submitted to Alaska Working Group in Cooperative Forestry/Fisheries Research. Project No. 009-002, dated May 20, 1991.

Peratrovich, Robert J. 1959. *Social and Economic Structure of the Henya Indians.* M.E. Thesis University of Alaska, Fairbanks.

Peterson, R. T. 1990. A field guide to western birds. Houghton Mifflin Co., Boston, MA.

Piatt, J. F. and G. Ford. 1993. Distribution and abundance of marbled murrelets in Alaska. Condor 95:662-669.

Quilan, S. E. and J. H. Hughes. 1990. Location and Description of a Marbled Murrelet Tree Nest Site in Alaska. Condor. Vol. 92, pp. 1068-1073.

Rabich-Campbell, C. 1984. Results of Test Excavations at Sarkar Cove, Southern Southeastern Alaska. Paper presented at the 11th Annual Meeting of the Alaska Anthropological Association, Fairbanks.

Rakestraw, L. W. 1981. *The United States Forest Service in Alaska.* Alaska Historical Commission and others, Anchorage, Alaska.

Ralph, C. J. and S. K. Nelson. 1992. Methods of Surveying Marbled Murrelets at Inland Forest Sites. Pacific Seabird Group Marbled Murrelet Technical Committee. USDA Forest Service, Pacific Southwest Forest Experimental Station, Redwood Science Lab, Arcata, California.

Raphael, M. G. 1984. Wildlife Populations in Relation to Stand Age and Area in Douglas-fir Forests of Northwestern California. In: W. Meehan, T. Merrell, and T. Hanley (eds.), Fish and Wildlife Relationships in Old-growth Forest: Proceedings of the Symposium, American Institute of Fishery Reservation Biology. Juneau, Alaska.

Raphael, M. G. and M. White. 1984. Use of Snags by Cavity-nesting Birds in the Sierra Nevada. Wildlife Monograph. p.86.

Reid, L. M. and T. Dunne. 1984. Sediment Production from Forest Road Surfaces. Water Resources Research. Vol. 20, pp. 1753-1761.

5 References

Reppert, R. T., W. Sigleo, E. Stakhin, and C. Meyers. 1979. Wetland Values, Concepts and Methods for Wetlands Evaluation. U.S. Army Corps of Engineers, Institute for Water Resources, Research Report 79-R1.

Reynolds, R. T., E. C. Meslow, and H. M. Wight. 1982. Nesting Habitat of Coexisting *Accipiter* in Oregon. Journal of Wildlife Management. Vol. 46, pp. 124-138.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, G. Goodwin, R. Smith, and EL. Fisher. 1991. Management Recommendations for the Northern Goshawk in the Southwestern United States. Northern Goshawk Scientific Committee, USDA Forest Service, Southwestern Region.

Robbins, C. S. 1979. Effect of Forest Fragmentation on Bird Population. In: DeFraaf, R. M. and K. E. Evans (eds.), Management of North-Central and Northeastern Forest For Nongame Birds. USDA Forest Service General Technical Report NC-S 1. St. Paul, Minnesota.

Robbins, C. S., B. Bruun, and H. S. Zim. 1983. A field guide to identification of birds in North America. Golden Press, New York, NY.

Robison, E.G. and R. L. Beschta. 1990. Coarse Woody Debris and Channel Morphology Interactions for Undisturbed Streams in Southeast Alaska, U.S.A. Earth Surface Processes and Landforms, Vol. 15, pp. 149-156.

Rogers, R. and E. Ablow. 1995. Fisheries and Watershed Resource Report. Control Lake Environmental Impact Statement. Submitted by Enserch Environmental Corporation.

Roppel, P. 1991. *Fortunes from the Earth: An History of the Base and Industrial Minerals of Southeast Alaska.* Sunflower University Press, Manhattan, Kansas.

Rosenberg, K. V. and M. G. Raphael. 1986. Effects of Forest Fragmentation on Vertebrates in Douglas Fir Forests. In: J. Verner, L. Morrison, and C. Ralph (eds.). Wildlife 2000. Modeling Habitat Relationships of Terrestrial Vertebrates. University of Wisconsin Press.

Rothacher, J. 1970. Increases in Water Yield Following Clearcut Logging in the Pacific Northwest. Water Resources Research. Vol. 6, pp. 653-658.

___________ 1973. Does Harvest in West Slope Douglas-Fir Increase Peak Flow in Small Forest Streams? Research Paper PNW-163. USDA Forest Service, Pacific Northwest Range and Experiment Station.

Ruth, RH. and AS. Harris. 1979. Management of Western Hemlock-Sitka Spruce Forests for Timber Production. GTR PNW-88. PNW Forest and Range Exp. Station, Portland, Oregon. 197 pp.

Schempf, P. F. 1981. Unpublished survey information. US Fish and Wildlife Service.

Schempf, P. F. 1982. Unpublished survey information. US Fish and Wildlife Service.

Schmiege, D.C., A. E. Helmers, and D. M. Bishop. 1974. The Forest Ecosystem of Southeast Alaska. General Technical Report PNW-28. USDA Forest Service, Pacific Northwest Range and Experiment Station, Portland, Oregon.

Schoen, J. W., M.D. Kirchhoff, and J. H. Hughes. 1988. Wildlife and Old-growth Forests in Southeast Alaska. Natural Areas Journal. Vol. 8, pp. 138-145.

Schwan, M. 1984. Southeast Alaska Sport Fish Assessment. Alaska Department of Fish and Game, Division of Sport Fish, Juneau, Alaska.

Sealaska Corporation. 1975. Native Cemetery and Historic Sites of Southeast Alaska. Submitted to Sealaska Corporation by Wilsey and Ham Consultants, Inc., Seattle, Washington.

Selkregg, L. L. (compiler). 1976. *Alaska Regional Profiles: Southeast Region.* For The State Of Alaska, Office of the Governor and The Joint Federal-State Land Use Planning Commission for Alaska. Arctic Environmental Information and Data Center, University of Alaska, Anchorage, Alaska.

Shaw, C. G. III. 1982. Development of dwarf mistletoe in western Hemlock regeneration in Southeast Alaska. Canadian Journal of Forest Research 12:482-488.

Shea, L. 1990. Impacts of development on the non-hunting, wildlife oriented businesses of southeast Alaska. Alaska Department of Fish and Game, Habitat Division.

Sheridan, W. L and W. J. McNeil. 1968. Some Effects of Logging on Two Salmon Streams in Alaska. Journal of Forestry. Vol. 66, pp. 128-133.

__________ 1982. Pink Salmon Escapements in Some Logged and Unlogged Streams in Southeast Alaska. USDA Forest Service, Alaska Region, Juneau, Alaska.

Sheridan, W. L. et al. 1984. Sediment Content of Streambed Gravels in Some Pink Salmon Spawning Streams in Alaska in Fish and Wildlife Relationships in Old-growth Forests. In: W. R. Meehan, T. R. Merrell, and T. A. Hanley (eds.), pp. 153-165. Proceedings of a Symposium, Juneau, Alaska, 12-15 April 1982.

Sidle, W. B. 1985. Habitat Management for Forest Birds in Southeast Alaska. Wildlife and Fisheries Habitat Management Notes. USDA Forest Service. Alaska Region Administration Document 146. Juneau, Alaska.

Sigman, M. J. 1985. Impacts of Clearcut Logging on the Fish and Wildlife Resources of Southeast Alaska. Alaska Department of Fish and Game, Technical Report. 85-3 (pg. 4).

Smith, R. D., R. C. Sidle, and P. E. Porter. 1993. Effects on bedload transport of experimental removal of a woody debris from a forest gravel-bed stream. Earth Surface Processes and Landforms 18:445-468.

Stewart, T. and R. Baker. 1993. Fisheries and Watershed Resource Report for the Polk Inlet Project Area. Ebasco Environmental, Bellevue, Washington.

Strickland, M. A. and C. W. Douglas. 1987. Marten. Pages 531-546 *In* Wild Furbearer Management and Conservation in North America. M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Ministry of Natural Resources, Ontario.

Suring, L. H., R. W. Flynn, J. H. Hughes, M. L. Orme, and D. A. Williamson. 1988a. Habitat Capability Model for Hairy Woodpeckers in Southeast Alaska: Winter Habitat. USDA Forest Service. Draft.

__________ 1988b. Habitat Capability Model for Brown Creepers in Southeast Alaska: Winter Habitat. USDA Forest Service. Draft.

Suring, L. H., D. A. Anderson, E. J. Degayner, R. W. Flynn, M. L. Orme, R. E. Wood, and E. L. Young. 1988c. Habitat Capability Model for Marten in Southeast Alaska: Winter Habitat. USDA Forest Service. Draft.

Suring, L. H., E. J. Degayner, and P. F. Schempf. 1988d. Habitat Capability Model for Bald Eagles in Southeast Alaska: Nesting Habitat. USDA Forest Service. Draft.

Suring, L. H., R. W. Flynn, J. H. Hughes, M. L. Orme, and D. A. Williamson. 1988e. Habitat Capability Model for Red-breasted Sapsuckers in Southeast Alaska: Breeding Habitat. USDA Forest Service. Draft.

Suring, L. H., D.C. Crocker-Bedford, R. W. Flynn, G. C. Inverson, M.D. Kirchhoff, T. E. Schenck, L.C. Shea, and K. Titus. 1992. A Strategy for Maintaining Well-Distributed, Viable Populations of Wildlife Associated with Old-Growth Forests in Southeast Alaska. Recommendations of an Interagency Committee. Juneau, Alaska.

Swanson, F. J. and G. W. Lienkaemper. 1978. Physical Consequences of Large Organic Debris in Pacific Northwest Streams. General Technical Report PNW-69. Pacific Northwest Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service, Portland, Oregon.

Swanson, F. J., M.D. Bryant, G. W. Lienkaemper, and J. R. Sedell. 1984~ Organic Debris in Small Streams, Prince of Wales Island, Southeast Alaska. General Technical Report PNW- 166. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Swanston, D. N. 1969. Mass Wasting in Coastal Alaska Research Paper PNW-83. USDA Forest Service, Juneau, Alaska.

Swanston, D. N. and D. A. Marion. 1991. Landslide Response to Timber Harvest in Southeast Alaska. In: S. S. Lan and Y. Huang Kuo (eds.), pp. 10-49 to 10-56. Proceedings of the Fifth Federal Interagency Sedimentation Conference, March 18-21. Las Vegas, Nevada.

Taylor, T. F. 1979. Species List of Alaskan Birds, Mammals, Freshwater and Anadromous Fish, Amphibians, Reptiles, and Commercially Important Invertebrates. USDA Forest Service, Alaska Region Report No. 82.

Thiel, R. P. 1985. Relationship between road densities and wolf habitat suitability in Wisconsin. Am. Midl. Nat. 113:404-407.

Thomas, J. W Editor. 1979. Wildlife habitats in managed forests-the Blue Mountains of Oregon and Washington. USDA Forest Service, Agricultural Handbook No. 553, 512 pp.

Thornton, T. 1992. Southeast Alaska Deer Harvest Summary 1987-1991, by Community, by WAA. Alaska Department of Fish and Game, Subsistence Division, Douglas, Alaska.

Titus, K., C. J. Flatten, R. E. Lowell. 1994. Northern goshwak ecology habitat relationships on the Tongass National Forest (goshawk nest sites, food habits, morphology, home range and habitat data)-final annual project report. USDA Forest Service Contract Number 43-0109-3-0272. Alaska Department of Fish and Game, Division of Wildlife Conservation. 69 pp + appendices.

TLMP. 1979a. See USDA Forest Service 1979a.

TLMP. 1990. DEIS. See USDA Forest Service.

TLMP. 1991a. See USDA Forest Service 1991a.

TLMP Draft Revision. See USDA Forest Service 1991a.

TLMP Revision. See USDA Forest Service 1997.

University of Oregon. 1983. Marine Recreation in the Tongass National Forest. Department of Planning, Public Policy, and Management, University of Oregon, Eugene, Oregon.

United States Department of Commerce (USDC), Bureau of the Census. 1992. 1990 Census of Population and Housing: Summary Tape File 1A, Pacific Division (Volume 1). CD90-1A-9-l. U.S. Bureau of Census, Data User Services Division, Washington, D.C.

USDA Forest Service. 1975. Honker Divide Management Plan, Final EIS. Alaska Region, R10-EEIS (Adm) 75-08.

__________ 1979a. Tongass Land Management Plan and Final EIS. Series Number 10-57. USDA Forest Service, Alaska Region, Juneau, Alaska.

__________ 1979b. Alaska Region Special Project Specifications for the Construction of Roads, Bridges, and Other Drainage Structures. Roadway Drainage Guide for Installing Culverts to Accommodate Fish. USFS-R10 Administrative Document No. 42.

__________ 1982. Landscape Management Handbook, Region 10, FSH 2309.22. Juneau, Alaska.

__________ 1983. Alaska Regional Guide, Alaska Region Report No. 126. USDA Forest Service, Alaska Region, Juneau, Alaska.

__________ 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. Part 1-Chapter Narratives. USDA Forest Service, Pacific Northwest Reg., Pub. R6-F&WL-192-1985.

__________ 1986a. Alaska Region, Administration Document 159.

__________ 1986b. Aquatic Management Handbook. FSH 2609.24. USDA Forest Service, Juneau, Alaska.

__________ 1987. Channel Types Field Guide, Draft. A Guide to Stream Mapping Units on the Tongass National Forest Chatham Area. USDA Forest Service, Tongass National Forest, Alaska Region, Juneau, Alaska.

__________ 1989a. Alaska Pulp Corporation Long-term Timber Sale Contract, Final Supplement to the Environmental Impact Statement for the 1981-86 and 1986-90 Operating Periods. R10-MB-81. Tongass National Forest, November 1989.

__________ 1989b. 1989-94 Operating Period for the Ketchikan Pulp Company Long-term Sale Area, Final Environmental Impact Statement, R10-MB-66a et al. USDA Forest Service, Alaska Region, Juneau, Alaska.

__________ 1990a. Analysis of the Management Situation, Tongass National Forest Land and Resource Management Plan Revision. R10-MB-89. Tongass National Forest, January 1990.

__________ 1990b. Kelp Bay Project, Economic and Social Resource Inventory Report, Chatham Area-Tongass National Forest. Tongass National Forest, R10-91 -05. December 1990.

__________ 1990c. Timber Supply and Demand, Alaska National Interest Lands Conservation Act Section 706(A), Report No. 10. R10-MB-156. USDA Forest Service, Alaska Region, Juneau, Alaska.

__________ 1991a. Tongass Land Management Plan Revision, Supplement to the Draft Environmental Impact Statement. USDA Forest Service, Tongass National Forest, RIO-MB-I 49 (Supplement to the Draft EIS), R10-MB-146 (Supplement to DEIS, Proposed Revised Forest Plan), RIO-MB-145 (Supplement to DEIS, Appendix Volume 1), and RIO-MB-144 (Supplement to DEIS, Appendix Volume 2). Alaska Region, Juneau, Alaska.

__________ 199lb. Soil and Water Conservation Handbook. FSH 2509.22. USDA Forest Service, Juneau, Alaska.

__________ 1991c. Field Guide to Rare Vascular Plants of the National Forests in Alaska. RIO-MB-128.

__________ 1992a. Channel Type User Guide Tongass National Forest Southeast Alaska. R10-TP-26. USDA Forest Service, Alaska Region.

__________ 1992b. Central Prince of Wales Draft Environmental Impact Statement, Ketchikan Pulp Company Long-Term Timber Sale Contract. Volume 1.. USDA Forest Service, Tongass National Forest, Ketchikan, Alaska.

__________ 1992c. North Revilla Draft Environmental Impact Statement. Ketchikan Pulp Company Long-term Timber Sale Contract. Vol. 1, USDA Forest Service, Tongass National Forest, Ketchikan, Alaska.

__________ 1992d. Draft Outfitter/Guide EA. Tongass National Forest, Ketchikan Area, Ketchikan, Alaska.

__________ 1992e. Memorandum of Agreement between the Alaska Department of Environmental Conservation and the USDA Forest Service, Alaska Region. Part of the Forest Service Alaska Region Water Quality Management Plan. Juneau, Alaska.

__________ 1992f. Monitoring Direct and Indirect Influence of Blowdown in Riparian Buffer Strips and New Perspectives Leave-Tree Islands. Ketchikan Area Office, Tongass National Forest.

__________ 1992g. Evaluation of The Island Group Report, Pertaining to Sec. 301(e), Tongass Timber Reform Act of 1990. USDA Forest Service, Alaska Region.

__________ 1992h. Native Timber Harvests in Southeast Alaska. USDA Forest Service General Technical Report PNW-GTR-284.

__________ 1992i. Tongass Land Management Plan Revision Team. Alaska Region, Juneau, Alaska.

__________ 1992j. Ecology and silviculture of yellow cedar in Southeast Alaska. November 1992 Information Exchange at Sitka, Alaska. Forest Health Management Report. Tongass National Forest, Alaska Region RIO-TP-24.

__________ 1993a. Forest Service. National Monitoring and Evaluation Strategy. Forest Service, Washington office.

__________ 1993b. Region 10 Reserve Tree Selection Guidelines.

__________ 1993c. Tongass Land Management Plan Revision Team. Alaska Region, Juneau, Alaska. (unpublished).

__________ 1993d. Final Monitoring Report-Soil Disturbance on the 89-94 KPC Long-term Sale Area. Ketchikan Area Watershed Group, Tongass National Forest.

__________ 1993e. Reserve tree selection guidelines. USDA Forest Service, Alaska Region. R10-MB-215

__________ 1993f. Bark deposition monitoring report. USDA Forest Service, Ketchikan Area Office, Tongass National Forest.

__________ 1993g. Salt Lake Timber Sale Environment Assessment. Tongass National Forest, Thorne Bay Ranger District, Thorne Bay, Alaska.

__________ 1994a. Inventory and analysis of landslides caused by the October 25, 26, 1993 storm event on the Thorne Bay Ranger District. USDA Forest Service, Tongass National Forest, Ketchikan Area Watershed Group.

__________ 1994b. (Draft) Adult salmon die-offs. USDA Forest Service, Tongass National Forest, Ketchikan Area Office.

__________ 1994c. Alternatives to using the timber type map for determining proportionality under the Tongass Timber Reform Act. Draft Report July 15,1994. USDA Forest Service, Alaska Region, Juneau, Alaska.

__________ 1994d. Cave Resources. Forest-wide direction and Standards and Guidelines (Draft).

__________ 1995a. Report to Congress-Anadromous Fish Habitat Assessment. Pacific Northwest Research Station, Alaska Region, Publication R10-MB-279.

__________ No Date A. Craig Ranger District 1991 Summary of Total Recreation Use by Activity, Craig Ranger District, Tongass National Forest, Craig, Alaska.

__________ No Date B. Priority List of Recreational Development Projects for Prince of Wales and Associates Islands, 1992-1997. Tongass National Forest, Ketchikan Area, Ketchikan, Alaska.

__________ No Date C. FSH 2409.18. Timber Sale Preparation Handbook and RIO Supplement 6.

__________ 1996. Tongass Land Management Plan Revision, Revised Supplement to the Draft Environmental Impact Statement. USDA Forest Service, Tongass National Forest, R10-MB-314 (Revised Supplement to the Draft EIS, Proposed Revised Forest Plan, and Map Packet). Alaska Region, Juneau, Alaska.

__________ 1997. Tongass Land Management Plan Revision, Final Environmental Impact Statement. USDA Forest Service, Tongass National Forest, R10-MB-338 (Record of Decision, Final Environmental Impact Statement—Part 1 and Part 2, Map Packet, Appendix—Volume 1, Volume 2, Volume 3, and Volume 4, and Errata). Alaska Region, Juneau, Alaska.

USDI Fish and Wildlife Service. 1982. Pacific Coast Recovery Plan for the American Peregrine Falcon *(Falco peregrinus anatum).* The Pacific Coast American Peregrine Falcon Recovery Team.

__________ 1994. Endangered and Threatened Wildlife and Plants; 90-Day Finding and Commencement of Status Review for a Petition To List the Alexander Archipelago Wolf. 50 CFR Part 17. Vol. 59, No. 97.

Warren, N.M. 1990. Old-growth habitats and associated wildlife species in the northern Rocky Mountains. USDA Forest Service, Northern Region. 47 pp.

Washington Department of Wildlife. 1987. Black-tailed deer *(Odocoileus hemionus columbianus)* winter habitat evaluation model for western Washington. 36 pp.

Whittaker, R. H. 1972. Evolution and Measurement of Species Diversity. Taxonomy. Vol. 21, pp. 213-251.

Wilcove, D. 1985. Nest Predation in Forest Tracts and the Decline of Migratory Songbirds. Ecology. Vol. 66, pp. 1211-1214.

Witmer, G. W., M. Wisdom, E. P. Harshman, R. J. Anderson, C. Carey, M. P. Kittel, I.D. Luman, J. A Rochelle, R. W. Scharpf, and D. A. Smithey. 1985. Deer and Elk. pp. 231-258, In: E. R. Brown, editor. Management of Fish and Wildlife Habitats in Forests of Western Oregon and Washington. USDA Forest Service Publication No. R6-F&WL-192-1985, 332p.

Woodbridge, B. 1988. Territory Fidelity and Habitat Use by Nesting Goshawks: Implications for Management. West. Sec. Wildlife Society, 10-13 February 1988, Hilo, Hawaii.

Wu, T. H. and D. N. Swanston. I980~ Risk of landslides in shallow soils and its relation to clearcutting in Southeastern Alaska Forest Science 26:495-510.

Chapter 6

Glossary

Chapter 6

Glossary

Acronyms

ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
AMS	Analysis of the Management Situation, Tongass National Forest Land and Resource Management Plan Revision
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
ASQ	Allowable Sale Quantity
ATTF	Alaska Timber Task Force
ATV	All-terrain Vehicle
BBF	Billion board feet
BLM	Bureau of Land Management
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Environmental Impact Statement
FPA	Forest Practices Act
FSH	Forest Service Handbook
FTE	Fulltime Equivalent
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
IPASS	Interactive Policy Analysis Simulation System
KPC	Ketchikan Pulp Corporation
KV	Knutsen-Vandenberg Act
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
M	Modification
MA	Management Area
MBF	Thousand board feet
MIS	Management Indicator Species
MM	Maximum Modification
MMBF	Million board feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service

NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORV	Off-road Vehicle
P	Preservation
PR	Partial Retention
PRIM	Primitive
R	Retention
RM	Roaded Modified
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROT	Remain-open Temporary
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Officer
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TDS	Total Dissolved Solids
TIS	Transportation Inventory System
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
USD1	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Acronyms

A-frame LTF
Log transfer facility system which consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.

Access
The opportunity to approach, enter, and make use of public lands.

Access management
The designation of roads for differing levels of use by the public.

Aerial harvest systems
See Logging Systems

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Alaska Pulp Corporation (APC)
Previously Alaska Lumber and Pulp Corporation.

Alevin
Young salmon that are still attached to the yolk sac, which provides nourishment.

All-terrain vehicle (ATV)
A wheeled vehicle less than 40 inches wide.

Allowable Sale Quantity (ASQ)
The maximum quantity of timber that may be sold each decade from suitable lands covered by the Forest Plan.

Alluvium
A deposit of sand or mud formed by moving water.

Alluvial fan
A fan-shaped deposit of sand, gravel, and fine material made by a stream where it runs out onto a level plain or meets a slower stream.

Alpine/subalpine habitat
The region found on a mountain peak above tree growth.

Alternative
One of several policies, plans, or projects proposed for decision-making.

Amenity
Resource use, object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. Amenity values typically are those for which monetary values are not or cannot be established.

Anadromous
Fish that ascend from the sea to breed in freshwater streams.

Anadromous fish
Anadromous fish spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steel head trout. There are also anadromous Dolly Varden Char.

Anadromous Fisheries Habitat Assessment
An assessment conducted in 1994 within the Tongass National Forest (published in 1995) to study the effectiveness of current procedures for protecting anadromous fish habitat and determine the need for any additional protection.

Analysis area
An area of land which has the same timber management costs and responses to timber management activities.

Appraisal
See Timber Appraisal.

Aquatic Habitat Management Unit (AHMU)
A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.

For 1997 TLMP:
Class I: Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.

Class II: Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams from 0-5 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.

Class III: Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sufficient sediment and debris to have an immediate influence on downstream water quality or fish habitat capability. These streams generally have bankfull widths greater than 5 feet and are highly incised into the surrounding hillslope.

Class IV: Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope.

Non-streams: Rills and other watercourses, generally intermittent and less than 1 foot in bankfull width, little or no incisement into the surrounding hillslope, and with little or no evidence of scour.

For TLMP 1979:
Class I AHMU: Streams with anadromous or high quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish.

Class II AHMU: Streams with resident fish populations and generally steep (6 to 15 percent) gradient (can also include streams from 0 to 6 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values and are separate from the high quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

Class III AHMU: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Background
The distance part of a landscape. The seen or viewed area located from 3 to 5 miles to infinity from the viewer. See also Foreground and Middleground.

Beach fringe habitat
Habitat that occurs from the intertidal zone inland 1,000 feet, and islands of less than 50 acres.

Bedload
Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Benthic
Refers to the substrate and organisms on the bottom of marine environments.

Best Management Practice (BMP)
Practices used for the protection of water quality. BMP's are designed to prevent or reduce the amount of pollution from nonpoint sources or other adverse water quality impacts while meeting other goals and objectives. BMP's are standards to be achieved, not detailed or site-specific prescriptions or solutions. BMP's as defined in the USDA Forest Service Soil and Water Conservation Handbook are mandated for use in Region 10 under the Tongass Timber Reform Act.

Biological diversity (Biodiversity)
The variety of life in all its forms and at all levels. This includes the various kinds and combinations of: genes; species of plants, animals, and microorganisms; populations; communities; and ecosystems. It also includes the physical and ecological processes that allow all levels to interact and survive. The most familiar level of biological diversity is the species level, which is the number and abundance of plants, animals, and microorganisms.

Boardfoot
A unit of wood 12" X 12" X 1". One acre of commercial timber in Southeast Alaska yields on the average 18,000 to 34,000 board feet per acre (ranging from 8,000 to 90,000 board feet per acre). One million board feet (MMBF) would be the volume of wood covering one acre two feet thick. One million board feet yields approximately enough timber to build 120 houses.

Bog
An undrained or imperfectly drained area with a vegetation complex composed of sedges, shrubs, and sphagnum mosses, typically with peat formation. See also Muskeg.

Bole
Trunk of the tree.

Broadcast burning
Burning or an area that has been clearcut to remove logging slash from the site. Broadcast burning is done to prepare sites for regeneration or improve wildlife habitat.

Brush disposal
Cleanup and disposal of slash and other hazardous fuels within the forest or project areas.

Buffer
The Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width on each side of all Class I streams and Class H streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

Candidate species
Those species of plant or animal which are under consideration (by US Fish and Wildlife Service and National Marine Fisheries Service) for listing as threatened or endangered but which are provided no statutory protection under the Endangered Species Act.

Canopy
See Overstory.

Cant
A log partly or wholly cut and destined for further processing.

Capability
An evaluation of a resource's inherent potential for use.

Carrying capacity
The maximum number of species that can be supported indefinitely by available resources in a given area.

Cave
Any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.

Cave resources
Any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens and speleothems.

Channel types
The defining of stream sections based on watershed runoff, landform relief, and geology.

Class I, II, III, IV, and Non-streams
See Aquatic Habitat Management Units.

Clearcut
The harvesting in one cut of all trees on an area. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres, except for specific conditions noted in the Alaska Regional Guide.

Climax
A community of plants and animals which is relatively stable over time and which represents the late stages of succession under the current climate and soil conditions.

Code of Federal Regulations
A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Commercial Forest Land (CFL)
Productive forest land that is producing or capable of producing continuous crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Commercial thinning
Thinning a stand where the trees to be removed are large enough to sell.

Commodity
Resources with monetary (market) or commercial value; all resource products which are articles of commerce, e.g., timber and minerals.

Corridor
Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility right-of-way.

Cover
Refers to trees, shrubs, or other landscape features that allow an animal to partly or fully conceal itself.

Critical habitat
Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

Cruise
Refers to the general activity of determining timber volume and quality, as opposed to a specific method.

Cultural resources
Historic or prehistoric objects, sites, buildings, structures, etc. that result from past human activities.

Cumulative effects
The impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Cumulative visual disturbance
The percent of a viewshed's seen area in a disturbed condition at any point in time.

Current timber supply
Timber specified by the Forest Service that has not been rejected by the purchaser and that has undergone analysis under the National Environmental Policy Act.

Cutover
Areas harvested recently.

Diameter at breast height (dbh)
The diameter of a tree measured 4 feet 6 inches from the ground.

Debris avalanche
The sudden movement downslope of the soil mantle; it occurs on steep slopes and is caused by the complete saturation of the soil from prolonged heavy rains.

Debrisflow
A general term for all types of rapid movement of debris downslope.

Debris torrents
Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris.

Deer winter range
Locations that provide food and shelter for Sitka black-tailed deer under moderately severe to severe winter conditions.

Degradation
The general lowering of the surface of the land by erosive processes, especially by the removal of material through erosion and transportation by flowing water.

Demographic
Pertaining to the study of the characteristics of human populations, such as size, growth, density, distribution, and vital statistics.

Developed recreation
Recreation that requires facilities that, in turn, result in concentrated use of an area, such as campgrounds and ski areas. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings. See also Dispersed recreation.

Direct employment
The jobs that are immediately associated with the long-term contract timber sale including for example logging sawmills and pulp mills.

Discounted benefits
The sum of all benefits derived from the forest over the life of a project.

Discounted costs
The sum of all costs incurred from the Project Area during the period of project implementation.

Discount rate
The rate used to adjust future benefits or costs to their present value.

Dispersed recreation
Recreational activities that are not confined to a specific place and are generally outside developed recreation sites. This includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments. See also Developed recreation.

Doline
A relatively shallow bowl- or funnel-shaped depression ranging in diameter from a few to more than 3,000 feet. Also known as a sinkhole.

Down
A tree or portion of a tree that is dead and laying on the ground.

Draft Environmental Impact Statement
A statement of environmental effects for a major Federal action which is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

Duff
Vegetative material covering the mineral soils in forests, including the fresh litter and well decomposed organic material and humus.

Eagle nest tree buffer zone
A 330-foot radius around eagle nest trees established in a Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Forest Service.

Effects
Effects, impacts, and consequences as used in this EIS are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social and may be direct, indirect, or cumulative.

Direct Effects-Results of an action occurring when and where the action takes place.

Indirect Effects-Results of an action occurring at a location other than where the action takes place and/or later is time, but in the reasonably foreseeable future.

Cumulative Effects-See Cumulative Effects

Encumbrance
A claim, lien, charge, or liability attached to and binding real property.

Endangered species
A species of plant or animal which is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. See also Threatened Species, Sensitive Species.

Endemic
Peculiar to a particular locality; indigenous.

Environmental analysis
A comprehensive evaluation of alternative actions and their predictable short-term and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. An EA is less comprehensive than an EIS, and may result in a Finding of No Significant Impact. Should the EA reveal significant impacts a full EIS must then be conducted.

Erosion
The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

Escapement
Adult anadromous fish that escape from all causes of mortality (human-caused or natural) to return to streams to spawn.

Estuarine fringe habitat
A 1,000-foot zone around an estuary.

Estuary
For the purpose of this EIS process, estuary refers to the relatively flat intertidal and upland areas generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-aged management
Management that results in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood, and other tree-cutting methods produce even-aged stands. See also Uneven-aged Management.

Executive order
An order issued by the President of the United States that has the force of law.

Existing visual condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:
Type I: These areas appear to be untouched by human activities.

Type II: Areas in which changes in the landscape are not noticed by the average person unless pointed out.

Type III: Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant. *Type IV* Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable it may resemble a natural disturbance.

Type V: Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.

Type VI: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be drastic disturbances.

Falldown
The difference between planned or scheduled harvest and that which is attained after implementation.

Fen
A tract of low, marshy ground consisting of organic terrain, relatively rich in mineral salts. See also Muskeg.

Final Environmental Impact Statement (FEIS or Final EIS)
The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the Draft EIS to include public and agency responses to the draft. The decisionmaker chooses which alternative to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

Fine
Minute particles of soil.

Fiscal year
The Federal Government's accounting period. October 1 through September 30; e.g., October 1, 1991 to September 30, 1992 = Fiscal Year 1992.

Fish habitat
The aquatic environment and the immediately surrounding terrestrial environment that combined afford the necessary physical and biological support systems required by fish species during various life stages.

Fish timing
A mitigation measure that restricts construction activities within an anadromous fish stream to minimize impacts on fish eggs, fry, and migrating salmonids. The normal period during which construction is permitted in fish streams is May 15 to August 20.

Floodplain
The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year.

Flu vial
Of or pertaining to streams and rivers.

Forage
To wander or go in search of food.

Forb
Any herbaceous plant that is not a grass or grass-like. Includes plants that are commonly called weeds or wildflowers.

Foreground
The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; the area located less than 1/4 mile from the viewer. See also Background and Middleground.

Forest or forest system land
National Forest lands currently supporting or capable of supporting forests at a density of 10 percent crown closure or better. Includes all areas with forest cover, including old growth and second growth, and both commercial and noncommercial forest land.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)
Amended in 1976 by the National Forest Management Act.

Forested habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Forested wetland
A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

Forest Supervisor
The Forest Service officer responsible for administering a single national forest. The office of the Forest Supervisor for the Ketchikan Area of the Tongass National Forest is located in Ketchikan, Alaska.

Geographic Information System (GIS)
An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Glide channel
Channel types that occur on lowlands and landforms and are mostly associated with bogs, marshes, or lakes.

6 Glossary

Grabinski
A modified highlead cable logging system.

Groundwater
Water within the earth that supplies wells and springs.

Guidelines
A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Habitat
The sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat capability
An estimate of the number of healthy individuals of a species that a habitat can sustain.

Haulout
An area of large, smooth rocks used by seals and sea lions for resting and pupping.

Humus
Substance of organic origin that is fairly but not entirely resistant to further bacterial decay.

IMPLAN
A computer-based system used by the Forest Service for constructing nonsurvey models to measure economic input. The system includes a database for all counties in the United States and a set of computer program to retrieve data and perform the computational tasks for input output analysis.

Inclusions
Soil types that are not delineated on soil resource inventory maps because they are too small (in area) to be mapped at the scale used in the inventory at any locale.

Indicator species
See Management Indicator Species

Indirect employment
The jobs in service industries that are associated with the Long-Term Contract timber sale including for example suppliers of logging and milling equipment. See also Direct Employment.

Interdisciplinary Team (IDT)
A group of people with different backgrounds assembled to research, analyze, and write a project EIS. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze a proposed action and its alternatives.

Irretrievable commitments
Loss of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription; if the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but not irreversible.

Irreversible commitments
Decisions causing changes that cannot be reversed. For example, if a roadless area is allocated to allow timber harvest, and timber is actually harvested, that area cannot at a later time be allocated to wilderness. Once harvested, the ability of the area to meet wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

Issue
A point, matter, or section of public discussion of interest to be addressed or decided.

Karst
A type of typography that develops in areas underlain by soluble rocks, primarily limestones. Sinkholes, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed are said to display "karst topography."

Knutsen- Vandenberg Act (KV)
An Act was passed by Congress in 1930 and amended in 1976 to provide for reforestation, resource protection, and improvement projects in timber sale areas from funds collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Landscape-level diversity
A function of the spatial distribution of habitat types across a large area (Sidle 1985) such as a Project Area or ecological province.

Land Use Designation (LUD)
A defined area of land specific to which management direction is applied.

Large woody debris (LWD)
Any large piece of relatively stable woody material having a least diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area.

Logging Systems
Highlead: A cable yarding system, using a two-drum yarder, in which lead blocks are hung on a spar or tower to provide lift to the front end of the logs.

Aerial Logging Systems: Systems where the cut logs are moved from the stump to the loading area or log deck without touching the ground.

Live Skyline/Gravity Carriage Return: A two-drum, live skyline yarding system in which the carriage moves down the skyline by gravity; thus, it is restricted tophill yarding. The skyline is lowered to attach logs then raised and pulled to the landing by the mainline.

Live Skyline/Haulback Required: A live skyline yarding system composed of skyline, mainline, and haulback; the carriage is pulled to the woods by the haulback; the skyline is lowered to permit the chokers to be attached to the carriage, and the turn is brought to the landing by the mainline.

Running Skyline: A yarding system with three suspended moving lines, generally referred to as the main, haulback, and slack-pulling, that when properly tensioned will provide lift, travel, and control to the carriage; normally indicates a gantry-type tower and a three-drum yarder. *Standing Skyline:* Used wherever yarding distances or span distances exceed the capability of live skyline equipment.

Tractor: Used to describe the full range of surface-skidding equipment, designed to operate on level to downhill settings.

Shovel A system of short-distance logging in which logs are moved from the stump to the landing by repeated swinging with a swing-boom log loader; the loader is walked off the haul road and out into the harvest unit; logs are moved and decked progressively closer to the haul road with each pass of the loader; when logs are finally decked at roadside, the same loader, or a different loader, loads out trucks. On gentle ground, logs are either heeled and swung or dragged by the boom as it rotates; larger log length and tree length logs are usually dragged to maintain machine stability. Soils should be moderate to well-drained and side slopes must be less than 20 percent; passes or stripes should be kept to a maximum of four.

Helicopter: Flight path cannot exceed 40 percent downhill or 30 percent uphill; landings must be selected so there is adequate room for the operation and so that the helicopter can make an upwind approach to the drop zone.

A-Frame: Beach fringe timber which is logged with a float-mounted yarder typically rigged in a highlead configuration for direct A-frame yarding.

Cold-deck and Swing: Planned to access areas not suitable for skyline operations.

Lag Transfer Facility (LTF)
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft or the formation of a log raft. It is wholly or partially constructed in waters of the United States and siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed “terminal transfer facility.”

Management area
An area one or more VCU’s in size for which management direction was written in the Tongass Land Management Plan.

Management Indicator Species (MIS)
Species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management. The following categories were used where appropriate: endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plant or animal selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

Management prescriptions
Management practices and intensity selected and scheduled for application on a specific area (e.g., a land use designation) to attain multiple-use and other goals and objectives.

Marginal
Commercial forest land (CFL) areas that do not qualify as standard or special CFL since they are not operable under short-term (ten years or less) projections of accessibility and economic conditions.

Mass failure
The downslope movement of a block or mass of soil. This usually occurs under conditions of high-soil moisture and does not include individual soil particles displaced as surface erosion.

Mass movement
General term for a variety of processes by which large masses of earth material are moved downslope by gravity either slowly or quickly.

Mass Movement Index (MMI)
Rating used to group soil map units that have similar properties with respect to the stability of natural slopes.

Mass wasting
A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. Also known as mass movement.

McGilvery soil
Soil type which represents the only well-drained organic soil found in the Ketchikan Area. It is composed of a thin layer (less than 8 inches deep) of organic duff overlying bedrock or boulders, generally occupying the upper backslopes of hills and mountains. These soils are associated with cliffs and rock outcrops, and are sensitive to disturbance.

Mid-market analysis
The value and produce mix represented at the quarter in which the pond log value (end-product selling price less manufacturing cost) for the species and product mix most closely matches the point between the ranked quarters of the Alaska Index Operation pond log value, adjusted to Common Year Dollars, where one half of the harvest of timber from the Tongass National Forest has been removed at higher values and one half of the timber has been removed at lower values during the period from 1979 to the current quarter (FSH 2409.22 R10 Chapter 531.1-2).

Mineral soils
Soils consisting predominantly of, and having is properties determined by, mineral matter.

Mitigation
Measures designed to counteract environmental impacts or to make impacts less severe. These measures may include avoiding an impact by not taking a certain action or part of an action, minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during he life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Model
A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness and is used as one of several tools to analyze a problem.

Monitoring
A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the matter called for (Implementation Monitoring); to confirm whether mitigation measures were effective (Effectiveness Monitoring); or, to validate whether overall goals and objectives were appropriate (Validation Monitoring). Different levels call for different methods of monitoring.

Multi-Entry Layout Plan (MELP)
Interdisciplinary design and mapping of all potential timber harvest units, including associated logging and transportation systems, within a project area.

Muskeg
In Southeast Alaska, a type of bog or fen that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

Natal streams
Home stream where an anadromous fish is hatched.

National Environmental Policy Act (NEPA)
An act, passed by Congress in 1969, that declared a national policy to encourage productive harmony between humans and their environment to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Forest plans, Regional guides, and regulations to guide that development.

Native allotment
At tract of non-mineral land, not to exceed 160 acres, on which an Alaska Native (who was 21 years of age or head of a household) established continuous use and occupancy prior to the creation of the National Forests (authorized under the Native Allotment Act of May 17, 1906).

Native Selection
Application by Native corporations and individuals to a portion of the Bureau of Land Management for conveyance of lands withdrawn in fulfillment of Native entitlements established under ANCSA.

Net sawlog volume
Trees suitable in size and quality for producing logs that can be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No-action alternative
The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Noncommercial forest land
Land with more than 10 percent cover of commercial forest tree species but not qualifying as commercial forest land (CFL).

Non-interchangeable components
Non-interchangeble components (NIC's) are defined as increments of the suitable land base and their contribution to the allowable sale quantity (ASQ) that are established to meet Forest Plan objectives. NIC's are identified as parcels of land and the type of timber thereon which are differentiated for the purpose of Forest Plan implementation. The total ASQ is derived from the sum of the timber volumes from all NIC's. The NIC's cannot be substituted for each other in the timber sale program.

NIC I Normal Operability: This is volume scheduled form suitable lands using existing logging systems. Most of these lands are expected to be economic under projected market conditions. On average, sales from these lands have the highest probability of offering a reasonable opportunity for a purchaser to gain a profit from his/her investment and labor. This is the best operable ground.

Normal operability includes those systems most frequently used on the Tongass. These systems are tractor, shovel, standard cable and some helicopter.

Tractor: Tractor logging includes all ground wheel or track system used for skidding logs to a landing. Shovel yarding is included; however, tractor or rubber-tire skidding used in conjunction with swing operations are not included.

Standard Cable: The most typical logging systems used on the Tongass. Included in the standard cable system component are highlead uphill, highlead downhill, slackline, running skyline, and flyer.

Standard Helicopter: Helicopter yarding with yarding distances up to three quarters of a mile.

NIC II: Difficult and Isolated Operability. This is volume scheduled from suitable lands that are available for harvest using logging systems not in common use in Southeast Alaska. Most of these lands are presently considered economically and technologically marginal.

Difficult operability includes those systems used on the Tongass which have significantly higher cost. These may include balloon, long-span skyline, multi-span, or helicopter with yarding distances greater than three-quarters of a mile. This category also includes lands which have limited access as a result of being isolated by prior harvest activities or other management activities.

Long Span Cable: Cable systems which require longer than average yarding distances. Typical long span cable systems considered are standing skylines and multispans.

Access Limitation: Logging systems required for areas with access limitation concerns. The logging system could be highlead cable when access to timber and roading is difficult. Typical harvest systems are helicopter and swing operations.

Isolated Operability: This class is comprised entirely of isolated stands. These are small stands of isolated timber which are extremely difficult to harvest. The harvest system could vary, but would be more costly due to the location of the stand. Typical harvest systems are helicopter with average yarding distances greater than one mile.

6 Glossary

Notice of Intent (NOI)
A notice printed in the Federal Register announcing that an EIS will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information. The NOI for this project was submitted on March 1, 1990.

Offering
A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a timber sale contract.

Off-highway vehicle (OHV)
Any vehicle that is restricted by law from operating on public roads for general motor vehicle traffic. Includes motorbikes, minibikes, trailbikes, snowmobiles, dunebuggies, all-terrain vehicles, and four-wheel drive, high clearance vehicles (FSM 2355.01). Sometimes referred to as Off-road vehicle or ORV.

Old-growth forest
Ecosystems distinguished by the later stages of forest stand development that differs significantly from younger forests in structure, ecological function, and species composition. Old-growth forest is characterized by a patchy, multi-layered canopy; trees that represent many age classes; large trees that dominate the overstory, large standing dead (snags) or decadent trees; and higher accumulations of large down woody material. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Overmature
The stage at which a tree declines in vigor and soundness, for example, past the period of rapid height growth.

Overstory
The portion of trees in a forest that forms the uppermost layer of foliage, usually formed by the tallest trees. Also called the canopy.

Partial cutting
Method of harvesting trees (not clearcutting) where any number of live stems are left standing in any of various spatial patterns. Can include seed tree, shelterwood, or other methods.

Peak Flow
The highest discharge of water recorded over a specified period of time at a given stream location.

pH
The degree of acidity or alkalinity.

Planning area
For the purpose of analyzing viable populations, the planning area is the ecological province, i.e., North Central Prince of Wales province and South Prince of Wales province.

Planning record
A detailed, formal account of the planning process for an EIS. The record contains data, maps, reports, planning process information, and results of public participation in the planning process. The Planning Record documents the decisions and activities that resulted in the Final EIS. Planning records are available for public review upon request under the Freedom of Information Act.

Pleistocene
The epoch forming the first half of the Quatemary period, originating about one million years ago.

Pond value
The delivered price of logs at the mill minus the cost to manufacture them into usable products.

Precommercial thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Present net value
The difference between benefits and costs associated with the alternatives.

Record of Decision (ROD)
A document separate from but associated with an EIS that states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternatives have been adopted, and if not, why not.

Recreation Opportunity Spectrum (ROS)
The system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skill needed to enjoy the area, and the relative density of recreation use. The classes are:
Primitive: An essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use is generally not permitted.
Semi-Primitive Nonmotorized: A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Use of local roads for recreational purposes is not allowed.
Semi-Primitive Motorized: A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Local roads used for other resource management activities may be present.
Roaded Natural: A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.
Roaded Modified: A natural environment that has been substantially modified particularly by vegetation manipulation. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.
Rural: A natural environment that has been substantially modified by development of structures and vegetative manipulation. Structures are readily apparent and may range from scattered to small dominant clusters. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high.

Reforestation
The natural or artificial restocking of an area with trees.

Regeneration
The process of establishing a new crop of trees on previously harvested land.

Region
An area covered by a Forest Service regional guide. A region is generally composed of one or more national forests. Forest Service Region 10 includes the Tongass National Forest and the Chugach National Forest.

Regional Forester
The Forest Service official responsible for administering a single region.

Regional Guide
The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. It guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands within a given report.

Research Natural Area (RNA)
An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community primarily for scientific and educational purposes. In Forest Service usage, RNA's are areas designated to ensure representative samples of as many major naturally occurring plant communities as possible.

Reserved
Lands that have been withdrawn from the timber base by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

Reserve trees
Merchantable or submerchantable trees and snags that are left within the harvest unit to provide biological habitat components over the next management cycle.

Resident fish
Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Retention
A visual quality objective which provides for management activities that are not visually evident to the casual observer.

Riparian Area
Transition zone between a stream or lake system and the adjacent land. Identified in part by soil characteristics or distinctive plant communities that require free or unbound water.

Riparian ecosystems
A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

Riparian management area
Land areas delineated in the Forest Plan to provide for the management of riparian resources. Specific standards and guidelines, by stream process group, are associated with riparian management areas. Riparian management areas may be modified by watershed analysis.

Road maintenance level

The level of service provided by, and maintenance required for, a specific road consistent with road management objectives and maintenance criteria (FSH 7709.58, Section 12.3).
Maintenance Level 1: Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period is one year or longer. Basic custodial maintenance is performed.
Maintenance Level 2: Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration.
Maintenance Level 3: Assigned to roads open and maintained for travel by the prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
Maintenance Level 4.. Assigned to roads that provide a moderate degree to user comfort and convenience at moderate travel speeds.
Maintenance Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-laned and paved, or aggregate surfaced with dust abatement.

Road Management Objective (RMO)

Defines the intended purpose of an individual road based on Management Area direction and access management objectives. Road management objectives contain design criteria, operation criteria and maintenance criteria. Long-term and short-term roads have RMO's.

Roads

Arterial: Developed an operated for long-term land and resource management purposes to constant service.
Collector: Collects traffic from Forest local roads; usually connects to a Forest arterial or public highway.
Local: Provides access for a specific resource use activity such as a timber sale or recreational site, although other minor uses may be served.
Preplanned: Roads planned in a prior EIS.
Temporary: For National Forest timber sales temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network and have stream crossing structures removed erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Roadless Area

An area of undeveloped public land identified in the roadless area inventory of the TLMP Revision within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Rotation

The planned number of years (approximately 100 years in Alaska) between the time that a Forest stand is regenerated and its next cutting at a specified stage of maturity.

Salvage sale

A timber sale to use dead and downed timber and scattered poor-risk trees that would not be marketable if left in the stand until the next scheduled harvest.

Sawlog

That portion of a tree that is suitable in size and quality for the production of dimension lumber, collectively known as sawtimber.

Scheduled timber harvests
Timber harvests done as part of meeting the allowable sale quantity.

Scoping process
Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action and the range of actions, alternatives, and impacts to be considered in an EA or an EIS.

Second-growth forest
Forest growth that has become established following some disturbance such as cutting serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

Seedling/sapling stage
The stage following timber harvest when most of the colonizing tree and shrub seedlings become established. Usually I to *25* years.

Selection cutting
The annual or periodic removal or trees (particularly mature trees), individually or in small groups from an uneven-aged forest to realize the yield and establish a new crop of irregular constitution.

Sensitive species
Plant and animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on a nonofficial State list, or that are recognized by the regional forester as needing special management on national forest lands to prevent placement on Federal or state lists.

Sensitivity level
The measure of people's concern for the scenic quality of the National Forests. In 1980 the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads trails, public use areas, and recreation cabins.
Level I: Includes all seen areas from primary travel routes use areas and water bodies where at least three-fourths of the forest visitors have a major concern for scenic quality
Level II: Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.
Level III: Includes all seen areas from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality.

Shade tolerance
Tree species that have physiological growth processes adapted to shaded environments Western hemlock is a shade tolerant species. Other tree species tolerance to shade may range from tolerant to intolerant.

Shelterwood cutting
A harvest method in which most of the trees are removed in an initial entry and some trees are left to naturally reseed the area and provide protection to new seedlings that establish on a site. A second entry may be conducted later to remove the remaining trees.

Significant
Specific legal term under the National Environmental Policy Act that requires considerations of both context and intensity in evaluating impacts.

Silvical characteristics
Physiological and genetic characteristics of individual tree species and the ecological characteristics (biological and environmental factors) of the site which enable a specific species to be adapted to a particular and unique site.

Silviculture
The art, science and practice of controlling the establishment, composition, structure and growth of trees and other vegetation in forest stands.

Silviculture practices
Management techniques used to modify, manage and replace a forest over time. Silvicultural practices are classified according to the method of carrying out the process (shelterwood, seed tree, clearcut, commercial thinning, etc.).

Sinkhole
Relatively shallow, bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet.

Site index
A measure of a forest area's relative productive capacity for tree growth. Measurement of site index is based on height of dominant trees in a stand at a given age.

Slash
Debris left over after a logging operation i.e., limbs, bark, broken pieces of logs.

Smolt
A juvenile salmon, trout, or Dolly Varden migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.

Snag
A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height.

Soil productivity
Capacity of soil to produce plant growth due to the soil's chemical, physical, and biological properties.

Soil texture
Relative amounts of sand, silt, and clay in a soil. Coarse-textured soils are generally considered sandy and often contain gravel of various sizes. Fine-textured soils are considered very fine, sandy, silty, or clay.

Special use permit
Permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.

Stand (tree stand)
A group of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

Standard
A course of action or level of attainment required by the Forest Plan to promote achievement of goals and objectives.

Stand-level diversity
The diversity within specific habitats or limited land areas as measured by number of species present (species richness) or structural complexity of a given habitat type (Sidle 1985).

State Historic Preservation Officer (SHPO)
State appointed official who administers Federal and State programs for cultural resources.

State selection
Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska under the Alaska Statehood Act.

Stream classes
See Aquatic Habitat Management Unit

Structural diversity
The diversity of forest structure, both vertically and horizontally, which provides for variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

Stumpage
The value of timber as it stands uncut in terms of dollar value per thousand board feet.

Subsistence use
The customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or family consumption; and for customary trade.

Subsistence use area
Important Subsistence use areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service-Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

Substantive comment
A public comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed.

Succession
The ecological progression of community change over time, characterized by displacements of species leading to a relatively stable climax community.

Suitable forestland
Commercial forestland identified as having both the biological capability and availability to produce industrial wood products.

Sustained yield
The amount of renewable resources that can be produced continuously at a given intensity of management.

Temporary roads
See Roads

Tentatively suitable forestland
Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Third order watershed
A watershed that contains a third order stream segment.

Thousand board foot measure (MBF)
A method of timber measurement equivalent to 1000 square feet of lumber one inch thick.

Threatened species
A species of plant or animal likely to become endangered within the foreseeable future throughout all or a significant portion of its range, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species. (See also Endangered Species and Sensitive Species.)

Tiering
Eliminating repetitive discussion of the same issue by incorporating by reference. The general discussion in an EIS of broader scope; e.g., this document is tiered to TLMP, as amended.

Timber appraisal
Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber entry
A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timber production
The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use.

Tongass Land Management Plan (TLMP)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest.

Tongass Resource Use Cooperative Survey (TRUCS)
A compilation of data on subsistence uses for evaluating the effects of the proposed action in this EIS.

Traffic service levels
Traffic characteristics and operating conditions that are used in setting road maintenance levels.

Turbidity
An indicator of the amount of suspended sediments in water.

Understory
The trees and shrubs in a forest growing under the main crown canopy or overstory.

Uneven-aged management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular size to retain within each area, thereby maintaining a planned distribution of size classes.

Unsuitable
Forest land withdrawn from timber utilization by statute or administrative regulation (e.g., wilderness), or identified as not appropriate for timber production in the forest planning process.

Utility logs
Those logs that do not meet sawlog grade but are suitable for production of firm usable pulp chips.

Value Comparison Unit (VCU)
Areas which generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Viable population
The number of individuals in a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations and adequately distributed throughout the region.

Viewshed
An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

Visual Absorption Capacity (VA C)
An estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.

Visual Quality Objective (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The

five categories of VQO's are:
Preservation: Permits ecological changes only. Applies to wilderness areas and other special classified areas.
Retention: Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation. *Partial Retention:* Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.
Modification: Management activities may visually dominate the characteristics landscape. However activities must borrow from naturally established form line color and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.
Maximum Modification: Management activities may dominate the landscape. Mitigation measures should be accomplished within five years of project completion.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Volume class
Used to describe the average volume of timber per acre in thousands of board feet (MBF). The seven volume classes include:
Classes 1 to 3: Less than 8 MBF/acre (cleared land seedlings or pole timber stands).
Class 4: 8 to 20 MBF/acre.
Class 5: 20 to 30 MBF/acre.
Class 6: 30 to *50* MBF/acre.
Class 7: 50+ MBF/acre.

V-notch
A deeply cut valley along some waterways, generally in steep, mountainous terrain, that would look like a "V" from a frontal view.

Volume Strata
Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan for each Administrative Area.

Watershed
That area that contributes water to a drainage or stream; portion of a forest in which all surface water drains to a common point. Can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Wetland
Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wild and Scenic Rivers
Rivers or sections of rivers designated by congressional actions under the 1968 Wild and Scenic Rivers Act. Wild and scenic rivers may be classified and administered under one or more of the following categories:

Wild river areas: Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
Scenic river areas: Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
Recreational river areas: Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wilderness
Areas designated under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions. In Alaska, wilderness also has been designated by TTRA and ANILCA.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCU's) for wildlife analysis and regulating wildlife populations.

Wildlife habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Wildlife Habitat Management Unit (WHMU)
An area of wildlife habitat identified during the IDT process as having values important to wildlife.

Windfirm
Configuration of harvest units so as not to create an opening which exposes the adjacent stand of timber to the direction of the major prevailing storm wind (southeast).

Windthrow
The act of trees being uprooted, blown down, or broken off by storm winds. Three types of windthrow include: endemic where individual trees are blown over, catastrophic where a major windstorm can destroy hundreds of acres, and management related where the clearing of trees in an area makes the adjacent standing trees vulnerable to windthrow.

Winter range
An area, usually at lower elevation, used by big game during the winter months.

Withdrawal
The withholding of an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws of the purposes of limiting activities under those laws to maintain other public values in the area.

Yarding
Hauling timber from the stump to a collection point.

Yield tables
Tables that estimate the level of outputs that would result from implementing a particular activity. Usually referred to in conjunction with FORPLAN input or output. Yield tables can be developed for timber volumes, range production, soil and water outputs, and other resources.

Chapter 7

Distribution List

Chapter 7

Distribution List

Agencies

Alaska Board of Fisheries
Alaska Department of Commerce and Economic Development
Alaska Department of Environmental Conservation
Alaska Department of Environmental Conservation, Director, Environmental Quality Division
Alaska Department of Environmental Conservation, SE Region Manager
Alaska Department of Fish and Game
Alaska Department of Fish and Game, Commercial Fish Management
Alaska Department of Fish and Game, Commercial Fisheries Division
Alaska Department of Fish and Game, Director, FRED Division
Alaska Department of Fish and Game, Division of Boards/SERC
Alaska Department of Fish and Game, Division of Habitat
Alaska Department of Fish and Game, Division of Sport Fishing
Alaska Department of Fish and Game, Division of Subsistence
Alaska Department of Fish and Game, Division of Wildlife Conservation
Alaska Department of Fish and Game, FRED Division
Alaska Department of Fish and Game, FRED Klawock Hatchery
Alaska Department of Fish and Game, Office of Commissioner
Alaska Department of Natural Resources, Division of Forestry
Alaska Department of Natural Resources, Division of Land
Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation
Alaska Department of Natural Resources, Office of Commissioner
Alaska Department of Natural Resources, State Historic Preservation Office
Alaska Department of Natural Resources, U.S. Forest Service, Regional Office
Alaska Department of Transportation
Alaska Division of Government Coordination
Alaska Energy Authority
Alaska Legal Information Office
Army Corps of Engineers
Equal Employment Opportunity Commission
Federal Energy Regulatory Commission
Federal Highway Administration, Region X
National Marine Fisheries Service, Division Chief
National Marine Fisheries Service, Protected Reserves, Alaska Region
SE Native Subsistence Commission
U.S. Bureau of Indian Affairs
U.S. Bureau of Mines
U.S. Department of Agriculture, Forest Service
U.S. Department of Agriculture, National Agricultural Library
U.S. Department of Energy
U.S. Department of Housing and Urban Development
U.S. Department of the Interior, Bureau of Land Management
U.S. Department of the Interior, Office of Environmental Affairs
U.S. Environmental Protection Agency

U.S. Environmental Protection Agency, Office of Environmental Review
U.S. Fish and Wildlife Service
U.S. Fish and Wildlife Service, Ketchikan

Libraries

Alaska State Library
Anchorage Municipal Library
Colorado State University Libraries
Craig Public Library
Hyder Public Library
Ketchikan Public Library
Klawock Public Library
Metlakatla Community School Library
Petersburg Public Library
Thorne Bay Community Library
University of Alaska Library
USDA Forest Service, Regional Office, Library
Wrangell Public Library

Media

Daily Sitka Sentinel
Island News
Juneau Empire
Ketchikan Daily News
KINY/KSUM Radio, Juneau
KRBD (FM), Ketchikan
KSTK (FM), Wrangell
KTKN (AM/KGTW (FM), Ketchikan
Petersburg Pilot
Wrangell Sentinel

Organizations and Businesses

Alaska Forest Association
Alaska Lumberman's Association
Alaska Native Brotherhood
Alaska Native Sisterhood
Alaska Society of Forest Dwellers
Alaska Women in Timber
Alaskans for Responsible Resource Management
Bishop Log Salvage
Byron Bros. Cutting
Clover Bay Lodge
Coffman Cove Civic Club
Control Lake Citizen's Group
Craig Advisory Committee
Craig Community Association
Eagle Timber, Inc.
Earth Justice Legal Defense Fund
Edna Bay Advisory Committee
Greater Gila Biodiversity Project
Greater POW Chamber of Commerce
Greenpeace, Alaska Forests Campaign
Harbour Logging Company
Harza Engineering Company
Harza Northwest, Inc.
Historical Research Associates

Hydaburg Advisory Committee
Impact Assessment, Inc.
Juneau Empire
Ketchikan Advisory Committee
Ketchikan Air Service, Inc.
Ketchikan Chamber of Commerce
Ketchikan Commercial Fishing Association
Ketchikan Indian Corporation
Ketchikan Pulp Company
Klawock Advisory Committee
Klawock Cooperative Association
Klawock Heenya Corporation
Klawock Tribal Government
Koncor Forest Products Company
Labouchere Bay Trading Post
Labouchere Bay School
Labouchere Community Club
Leslie Cutting, Inc.
Lynn Canal Corporation
Petersburg Chamber of Commerce
Point Baker Community Council
POW Conservation League
Prince of Wales Chamber of Commerce
Retreat Island
Robertson, Monagle, and Eastaugh
Saxman Advisory Committee
SE Alaska Conservation Council
SEACC, Juneau
Sealaska Corporation
Sealaska Timber
Shaan-Seet, Inc.
Silver Bay Logging
Sitka Tribe of Alaska
Society of American Foresters
Southeast Alaska Conservation Company
Southeast Conference
Stuntzner Engineering and Forestry
Sumner Strait Advisory Committee
Thorne Bay School
Timber Consultants, Inc.
Tongass Cave Project
Tongass Conservation Society
Tongass Sportfishing Association
Tongass Tribe
Trout Unlimited Alaska
University of Alaska (SE)
Whale Pass School
Wrangell Advisory Committee
Wrangell Resource Council
Ziegler, Cloudy, King and Peterson

7 Distribution List

Public Officials and Offices

Alaska Office of the Governor, Juneau
Alaska State Senator Robin Taylor
City of Coffman Cove, Mayor
City of Craig, City Administrator
City of Hydaburg
City of Kasaan, Mayor
City of Ketchikan, Mayor
City of Klawok, Mayor
City of Kupreanof
City of Port Alexander
City of Saxman, Mayor
City of Thorne Bay, City Administrator
City of Thorne Bay, Mayor
City of Wrangell, Mayor
Community of Edna Bay
Ketchikan Gateway Borough, Borough Manager
Ketchikan Gateway Borough, mayor
Legislative Information Office
Point Baker Post Office
Port Protection Community Association
U.S. House of Representatives, Donald Young
U.S. Senator Frank Murkowski
U.S. Senator Ted Stevens

Individuals

Ed Adamson
Richard and Kay Andrew
Glen Arnold
Fred and Cheryl Athorp
Paul Barnes
Tilden Blake
Jon Bolling
Judy Brakel
Thomas and Deborah Buoy
Jackie Canterbury
Jacob Cebula
Elizabeth Clayton
Steve Conelly
Thomas L. and Marylyn Conley
David Csiki
Janet Demars
Jim Dennis
Susan Domenowski
Bruce N. Eagle
Linda Easom
Frank C. Ellis
Cheryl Fecko
Kurt Flynn
Marvin George
John Gleason
Steve Gossman
Jim Green
Julie Hammond-Penn
Donald Hernandez
William Hollywood IV
William J. Holman
Jerry Jones
Jack Leighty
Steve Lewis
Buck Lindkugel
Heidi Lindgren
Katie Herbert
Steve Markuson
Thomas Martinez
Carolyn Mayhee
Victoria McDonald
Mike McKimens
Ira and Lucille Merrill
Jack L. Miner
Mark Minillo
Daniel Monteith
Dick Myren
Kent Nicholson
Ronald Paden
David K. Person
Walter Shuham
Anita Sondenaa
Cathy Starkweather
John R. Swanson
Patrick and Ginny Tierney
Kenneth D. Vaughan, P.E.
Ed Zastrow

Chapter 8

Preparers

Chapter 8

Preparers

***Randal L. Fairbanks**, Project Manager

M.S., Forest Resources Wildlife Science and Biostatistics, University of Washington, 1979
B.S., Forest Resources Wildlife Science, 1972

Foster Wheeler Environmental: 18 years   Other: 3 years

Twenty-one years experience in the design, coordination, and management of comprehensive environmental monitoring programs, ecological research and inventories, impact assessments, and mitigation plans. Key contributor or project manager for more than 10 major EIS/EA efforts, half for the Forest Service. Managed wildlife studies for several Alaska-based environmental projects in southeast and south-central Alaska. Also participated in studies on the North Slope, in the Chukchi Sea, Bering Sea, and Aleutian Islands.

***Tom Stewart**, IDT Leader, Soils and Watershed, Water Resources

Ph.D., Physical Geography, University of Alberta, 1988
M.S., Physical Geography, University of Alberta, 1981
B.A., Physical Geography, University of California, 1974

Foster Wheeler Environmental: 5   Other: 11

Sixteen years experience in geomorphology, hydrology, soil-vegetation-landform relations, and wetlands delineation. Experienced in field and analytical studies of sediment transport; assessing impacts of forestry operations, roads, and structures on stream, slope, and soil stability; and in mitigating these impacts through implementation of BMP's and compliance with State and Federal regulations. Worked for four seasons with the Forest Service on the Tongass and Chugach National Forests conducting soil surveys; mapping soils, vegetation, and stream channels; locating roads; and conducting soil and erosion control.

Larry Lunde, Forest Service Team Leader (Contracting Officer's Representative [CORI) B.S., Forest Management, Washington State University, 1973

USDA Forest Service: 20

Tongass National Forest, Ketchikan Area Planning Staff. Previous experience in forest and multiple-use management positions as District Resource Staff and District Ranger on: Nez Perce National Forest in Idaho, El Dorado National Forest in California, Gifford Pinchot National Forest in Washington, Mount Hood and Fremont National Forests in Oregon.

---

* ID Team Member

***Al Wolfson**, Silviculture, Economics

Graduate Study in Forest Economics, University of Washington, 1987-91
M.F., Forest Management, Oregon State University, 1971
B.S. Forest Management, Utah State University, 1970

Foster Wheeler Environmental: 3 Other: 21

Twenty-one years experience in natural resource management. Sixteen years with the USDA Forest Service as a District Ranger, certified silviculturist, and resource planner. Since 1986 as a consulting forester and economist Mr. Wolfson has performed over 40 feasibility studies and environmental assessments for natural resource clients.

***Jeff Boyce**, Vegetation and Timber

Silviculture Institute (currently enrolled)
M.S., Forest Resource Management, University of Washington, 1990
B.S., Forest Management, Washington State University, 1985

Harza Northwest: 4 Other: 7

Expertise in various areas of forest resource management, contract administration, and microcomputer systems. Project experience on EIS's, surveys, timber sales, and mapping projects including aerial photo interpretation and mapping as used for forest stand inventory, wildlife habitat management, and forested wetland delineation; forest inventory sampling; Northern Spotted Owl habitat surveying and mapping; timber sale layout planning for clearcut and partial cut logging systems; and identification of cutting unit boundaries for the protection of riparian corridors and wildlife retention areas.

***Elizabeth Ablow**, Fisheries

B.A., Environmental Studies, Yale University, 1987
B.A., Anthropology, Yale University, 1987

Foster Wheeler Environmental: 5 Other: 2

Seven years of experience in conducting stream habitat studies that have included collecting hydraulic, water quality, and stream habitat field data; identifying riparian vegetation; mapping riparian and stream habitats; conducting stream reach stability surveys; and conducting IHM studies. Conducts extensive fish population surveys on both game and nongame fish species.

***Cindi Confer**, Wildlife

B.S., Wildlife Science, Oregon State University, 1988

Harza Northwest: S Other: 3

Extensive experience with USDA Forest Service projects in wildlife habitat assessment and management. Expertise in Northern Spotted Owl and big game surveys, data analysis and interpretation, and mitigation and enhancement planning from project work at Harza Northwest and previously as a wildlife biologist with the USDA Forest Service.

Garrett Jackson, Soils

M.S., Geosciences, University of Arizona, 1990
B.S., Geosciences, University of Arizona, 1986

Foster Wheeler Environmental: 3 Other: 3

Six years of theoretical and applied geomorphology, including field and analysis work for various EIS's and EA's. Expertise in hillslope studies; mapping of stream channels, fluvial deposits, and landforms; soil-vegetation associations; and geologic hazard evaluation.

Amichay Greenstein, Economist/Planner

M.A., Development Economics, The American University, Washington D.C., 1991
B.S., Business Administration/Accounting, The American University, 1989

Foster Wheeler Environmental: 4 Other: 2

Six years of experience in socioeconomic impact and economic feasibility analysis of environmental, construction, and maintenance projects. Directly responsible for the methodological analysis of local and regional economic and social impacts on population, employment, housing, and communal services as well as assessment of project economic and financial viability.

Geoffrey M. McNaughton, Silv. Prescriptions, Field Manager

Ph.D., Forest Resources, University of Washington, 1991
M.S., Botany, University of Wyoming, 1984
B.S., Forest Science/Botany, University of Montana, 1981

Foster Wheeler Environmental: 3 Other: 15

Eighteen years of experience in forest ecology, tree physiology, and forest management, including extensive experience on the Polk Inlet Timber Sale project on Prince of Wales Island. Served as field manager and primary author of silvicultural prescriptions on the Control Lake Project.

Robert Rogers, Watershed

M.S., Geology/Geomorphology, Colorado State University, 1989
B.S., Geology, Appalachian State University, 1986

Foster Wheeler Environmental: 2 Other: 5

Over seven years experience in designing, collecting, analyzing, and preparing reports in geologic, hydrologic, and geomorphic studies for research and environmental assessment in the United States and Central America.

8 Preparers

***Richard Bielefeld**, Geology, Karst

Postgraduate Studies, Civil Engineering, Long Beach State University, 196
B.S., Geology, Long Beach State University, 1961

Harza Engineering Company: 3 Other: 26

Almost 30 years of experience in field investigation, design, project management, and preparation of geological and geophysical reports for feasibility, reinvestigation, SEED studies, and site seismic analyses.

Craig Cooper, Geology, Karst

M.S., Geological Sciences, Western Washington University, 1994
B .A., Business Administration, University of Washington, 1986

Harza Northwest: 2

Project experience in environmental impact assessment and geology with expertise in practical karst hydrology and emphasis on groundwater monitoring. Comprehensive experience in karst vulnerability assessment.

***Mark Greenig**, Landscape Resource Planner, Recreation Resources Team Leader M.U.P., Urban Planning, Texas A&M University, 1985

B.S., Landscape Architecture, California Polytechnic State University, 1978

Foster Wheeler Environmental: 4 Other: 11

Fifteen years of experience in planning, evaluating, designing, and managing projects in the built and natural environment. Work includes environmental impact assessment, recreation planning, recreation facility design, visual resource analysis, site planning, landscape design, real estate development, and tourism planning.

Kathy Smayda, Harza Northwest Project Manager

M.S., Botany, University of Washington, 1982
B.S., Biology/Ecology, Marlboro College, Vermont, 1978

Harza Northwest: 10 Other: 1

Extensive experience as a wetlands specialist, botanist, and ecologist in wetland delineation, wildlife habitat assessment, wildlife mitigation planning, and biological interpretation for projects including various plant and wildlife surveys, EIS's, EA's, and monitoring studies.

Steve Bedross, Visual Resources

M.L.A., Landscape Architecture, University of Michigan, 1990
B.S., Natural Resources, University of Michigan, 1987

Harza Northwest: 5 Other: 4

Experienced in environmental impact assessment, wetland mitigation, and landscape planning/design, including USDA Forest Service projects. Has conducted wetland assessments; planned and implemented visual impact studies; participated in recreation master planning and detailed design; and conducted environmental studies for hydropower licenses.

***Rick Suttle**, Visual Resources

M.L.A., Landscape Architecture, University of Michigan, 1978 B.S., Natural Resources, University of Michigan, 1975

Harza Northwest: 17 years Other: 3 years

Extensive project experience with environmental impact assessments, site selection studies, recreation and land management, reclamation/landscape restoration projects, and wetland inventories and mitigation. Mr. Suttle also managed Harza's computer-generated simulation system used for assessing visual impacts and presenting proposed design solutions, frequently gives agency and public presentations, and has served as an expert witness on recreation and visual resources at FERC hearings in Washington, D.C.

***Keith Jehnke**, Transportation Engineer

B.S., Forest Engineering, Oregon State University, 1986
B.S., Civil Engineering, Oregon State University, 1986

Stuntzner Engineering and Forestry: 7 Other: 2

Project engineer on numerous design/construction management projects with extensive experience working with local, state, and national permitting/planning requirements. Has also worked on various surveys, water rights, timber inventory projects, and timber sales, including the Lab Bay EIS in Southeast Alaska. Licensed professional engineer.

Cliff Barnhart, Logging Engineer

B.S., Forest Engineering, Oregon State University, 1987

Stuntzner Engineering and Forestry: 3 Other: 3

Logging engineer with extensive experience in road and timber harvest unit design, including network and economic analysis. Experience with timber management, reforestation, appraisals, and analysis of logging systems.

Judith Schneider, NEPA/Public Involvement Coordinator B .A., English/History, University of Wisconsin-Oshkosh, 1966

Foster Wheeler Environmental: 6 Other: 20

Twenty-four years of experience in public, political, and community relations and in the development and production of public information materials. Public involvement task manager for numerous EIS's and hazardous waste Superfund projects.

8 Preparers

Kristin Avery, NEPA/Public Involvement Coordinator

B.A., English-Writing Arts/Philosophy (pending), State University of New York at Oswego

Foster Wheeler Environmental: 3 Other: 3

Six years of experience in public education and community involvement, including the development and production of public information materials. Experience working with tribes; communicating sensitive or controversial issues; and coordinating large, complex events and meetings. Public involvement coordinator for other Alaska EIS's.

***T. Weber Greiser**, Cultural Resources Specialist

Graduate work, University of Colorado, completed 1977
M.S., Anthropology, University of New Mexico, 1972
B.A., Anthropology, University of New Mexico, 1969

Historical Research Associates, Inc.: 15

Thirteen years experience as project manager and/or principal investigator and eighteen years field experience on cultural resource projects in eight states. Expertise in archeological surveys, excavation, predictive modeling, laboratory analysis, historical archeology, and anthropological-legal studies.

Mike Galginaitis, Subsistence

Ph.D., Candidate, State University of New York, Binghamton
B.A., Social and Behavioral Sciences, Johns Hopkins University, 1973

Impact Assessment, Inc.: 8 Other: 5

Project coordinator, field researcher, analyst, and writer in the areas of subsistence and social impacts, primarily in Alaska. For the Lab Bay Project, responsibilities included subsistence and socioeconomic analyses of proposed timber sale options with primary responsibility for subsistence field work, Subsistence Resource Inventory and Environmental Consequences Reports, and sections of the EIS dealing with subsistence. Also participated in ANILCA hearings and DEIS scoping meeting. Extensive research experience on subsistence and socioeconomics.

Other Key Contributors

Ron Stuntzner, Lead Engineer
B.S., Forest Engineering, Oregon State University, 1964

Stuntzner Engineering and Forestry: 27 (owner/partner) Other: 6

Over 30 years experience in all aspects of forest engineering and consulting on various projects for timber companies, governmental agencies, and appraisers/financial institutions. Recently served as lead logging engineer on Lab Bay EIS in Southeast Alaska for the USDA Forest Service.

Eric Urstadt, Logging Engineer

B.S., Forest Engineering, Oregon State University, 1985

Stuntzner Engineering and Forestry: 3 Other: 6

Logging engineer with extensive experience in road design and timber sale layout. Survey crew chief on cadastral construction and property surveys. State-certified timber cruiser.

Jim Thrall, Harza Project Coordinator

Ph.D., Biological Science, Illinois State University, 1972
M.A., Biological Science, St. Mary's College, 1967
B.A., Biology, St. Mary's College, 1964

Harza Engineering Company: 20 Other: S

Served as lead environmental scientist and/or project manager for both environmental and resource planning projects, supervising the preparation of monitoring programs, EIS's, and EA's. Recently served as Project Manager for the USDA Forest Service Lab Bay EIS in Southeast Alaska.

Greg Green, Wildlife Biologist

M.S., Wildlife Ecology, Oregon State University, 1983
B.S., Biology, Eastern Oregon State College, 1978

Foster Wheeler Environmental: 8 Other: 7

Fifteen years experience in conducting wildlife population and habitat studies and producing related reports. Extensive experience throughout coastal and marine Alaska with both terrestrial and marine wildlife. Expertise with raptors, big game, and small mammals.

Mary Jo Russell, GIS Analyst

B.S., Business Administration, Menlo College, 1988

Foster Wheeler Environmental: 4 Other: 3

Seven years extensive experience includes GIS support for several USDA Forest Service EIS's. Expertise in digitizing; extensive analyses including suitable timber analysis, unharvested timber analysis, and total area analysis; surface modeling for perspective visual analysis; scanned ortho-photo image manipulation; extensive map production; and database manipulation and management.

8 Preparers

Jim Glassley, Senior GIS Analyst

B.S., Physical Geography, Western Washington University, 1990

Foster Wheeler Environmental: 3.5 Other: 1.5

Five years experience in applying computer cartography and GIS to wildlife management, natural resource management, and hazardous waste materials mitigation. Operates several GIS and computer cartography software programs to use in remote sensing, aerial photodigitizing, data input, spatial analyses, and map production.

Craig Lukin, GIS Manager

M.S. Marine Geology, Virginia Institute of Marine Science at the College of William and Mary, 1983
B.A., Geology, Queens College, City University of New York, 1977

Foster Wheeler Environmental: 2 Other: 14

Fourteen years experience in environmental-geological mapping; GIS analysis; applications development; and related technology. For the past 4 years, Mr. Lukin has applied GIS technology to hazardous waste RI's and FS's and NEPA EA's and EIS's.

Production Assistance

Tim Richards	Graphics
Danene Warnock	Graphics
Lynn Skaves	Graphics
Evelyn Roberts	Word Processing
Lawrence Kellie	Word Processing
Linda Plantz	Word Processing

Art Credits

Photos:
D. DellaSalla
M. Greenig
G. Jackson
J. Lobdell
T. Stewart
S. Sundberg
D. Volsen

Our thanks to Ketchikan Gateway Borough, Planning Department, for the use of several line art drawings from Atlas of the Ketchikan Region, 1978.

Cover Design: Tim Richards, Foster Wheeler Environmental

Chapter 9

Index

Chapter 9

Index

Symbols

A

B

C

G

H

J

K

L

V

W

☆ U.S. GOVERNMENT PRINTING OFFICE: 1997 - 689-113 / 41954 REGION NO. 10